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ZACHER (F.). **Die Afrikanischen Baumwollschädlinge.** [African cotton pests.]—*Arbeit k. biol. Anst. Land- und Forstwirtschaft, Berlin*, ix, no. 1, 1913, pp. 121-230, 83 figs.

Insect pests of the cotton plant in Africa are described at considerable length. The significance of the pests, methods of combat by means of poisons, traps or natural enemies, other plant hosts of the insects, and the immunity of certain species of plants are discussed. Insects which are useful to cotton in preying upon harmful insects are mentioned. The life-history of many of the pests is given. The following is a list of injurious insects, arranged according to the part of the plant they attack.

Damaging the roots: ORTHOPTERA: *Brachytrypes membranaceus*, F.; LEPIDOPTERA: larvae of *Euxoa segetum*, Schiff., *E. spinifera*, Hb., and *Agrotis ypsilon*, Rott; COLEOPTERA: larvae of *Tetralobus* sp., *Heterodes* sp., *Aeolus inscriptus*, Er., *Diplognatha gagates*, F., *Camenta westermanni*, Har., *Schizonycha serrata*, Aulm., *Enaria melanictera*, Klg., *Popillia hilaris*, Kr., *Synistovalgus bifasciatus*, Kr.

Damaging the stem: COLEOPTERA: *Alcides brevirostris*, Boh., *Sphenoptera gossypii*, Kerr., *S. neglecta*, Klg., *Apate monachus*, F., *Hypothenemus eruditus*, Westw., *Apion armipes*, Wagn., *A. xanthostylum*, Wagn.

Damaging the leaves: RHYNCHOTA: *Pseudococcus virgatus*, Ckll., *Chionaspis aspidistrae*, Newst., *C. aspidistrae* var. *gossypii*, Newst., and *Lecanium nigrum*, Nietn.; ORTHOPTERA: *Schistocerca peregrina*, Ol., *Zonocerus elegans*, F., *Phymateus viridipes*, Stal., *Phaneroptera nana*, Fieb.; LEPIDOPTERA: larvae of *Sylepta derogata*, F., *Hymenia (Zinkenia) fascialis*, Cram., *Basiothia charis*, Wlk., *Hippotion celerio*, L., *Celerio lineata*, F., var. *livornica*, Esp., *Prodenia litura*, F., *Euxoa segetum*, Schiff., *E. spinifera*, Hb., *Agrotis pronuba*, L., *A. ypsilon*, Rott., *Plusia confusa*, *P. circumflexa*, *Cosmophila erosa*, Hb., *Porthesia virguncula*, Walk., *Nudaurelia* sp., *Tephrina contexta*, Saalm., *Syngamia abruptalis*, Wlk.; COLEOPTERA: *Diplognatha gagates*, F., *Camenta*

westermanni, Har., *Schizonycha serrata*, Aulm., *Enaria melanictera*, Klg., *Popillia hilaris*, Kr., *Synistovalgus hemipterus*, Kr., *Epipedosoma laticolle*, Kolbe, *Systates pollinosus*, Gerst., *Aphthona* sp., *Nisotra uniforma*, Jac., *Syagrus puncticollis*, Lef., *Ootheca mutabilis*, Sahlb., *O. bennigseni*, Wse., *Titoboea ruficollis*, Ol., ; RHYNCHOTA : *Helopeltis bergrothi*, Reut., *Calidea bohemani*, Stal, *C. apicalis*, Schout., *Hotea subfasciata*, Westw., *H. acuta*, Stål, *Aphis medicae*, Koch, *A. gossypii*, Glov., *A. sorghi*, Theo. ; ACARI : *Tetranychus* sp..

Damaging the flower : —LEPIDOPTERA : larvae of *Earias insulana*, Boisd., *Chloridea obsoleta*, F. ; COLEOPTERA : *Mylabris bizonata*, Gerst., *Coryna hermanniae*, F., *C. dorsalis*, Gerst.

Damaging the boll and seeds : COLEOPTERA : *Diplognatha gagates*, F., *Apion xanthostylum*, Wagn., *Cathorama* sp., *Tribolium ferrugineum*, F., *T. confusum*, Duv., *Laemophloeus pusillus*, F., *Palorus melinus*, Hbst., *P. ratzeburgii*, Wissm., *Silvanus surinamensis*, F., *Tenebroides mauretanicus*, L., *Bruchus chinensis*, L., *Araecerus fasciculatus*, de G. ; LEPIDOPTERA : larvae of *Chloridea obsoleta*, F., *Diparopsis castanea*, Hmp., *Earias insulana*, Boisd., *E. fabia*, Cr., *E. chromataria*, Wlk., *E. plaga*, Boisd., *Gelechia gossypiella*, Saund., *Pyroderces simplex*, Wlsm., *Stagmatophora gossypiella*, Wlsm., *Agrotis ypsilon*, Rtt., *Euxoa spinifera*, Hb., *Ephestia cautella*, Walk. ; RHYNCHOTA : *Dysdercus cardinalis*, Gerst., *D. fasciatus*, Sign., *D. nigrofasciatus*, Dist., *D. superstitiosus*, F., *Oxycarenus hyalipennis*, Costa, *O. gossypinus*, Dist., *O. dudgeoni*, Dist., *O. exitiosus*, Dist., *D. albidipennis*, Stål, *Leptoglossus membranaceus*, F., *Anoplocnemis curvipes*, F. ; DIPLOPODA : *Odontopyge* sp.

The insects useful to the plant are chiefly Hymenoptera, which destroy many injurious species. *Alesia striata* (COCCINELLIDAE) is is mentioned as destroying scale-insects.

ZACHER (F.). **Die Schädlinge der Kokospalmen auf den Südseeinseln.** [Pests of the coconut-palm in the South Sea Islands.] *Arbeit. k. biol. Anst. Land- und Forstwirtschaft, Berlin*, ix, no. 1., 1913, pp. 73-119, 38 text figs.

A complete list of the insect pests of the coconut-palm in the South Sea Islands. In most cases a description is given of the insect, together with details as to its distribution, life-history, and mode of attack. The following species are mentioned :—

COLEOPTERA : *Oryctes rhinoceros*, L., *O. preussi*, Kolbe, *Trichogomphus semilinki*, Rits., *Xylotrupes nimrod*, Voet, *X. corquini*, Deyr., *Scapanes australis*, Boisd., *S. grossepunctatus*, Sternbg., *Oryctoderes latitarsis*, Burm., *Pimelopus tenuistriatus*, Aulm., *P. preussi*, Aulm., *P. robustus*, Aulm., *P. pygmaeus*, Aulm., *Horonotus quadrituber*, Zacher, *Mycterophallus xanthopus*, Boisd., *Glyciphana versicolor*, F., *Eubussea dilatata*, Zacher, *Eurytrachelus pilosipes*, Waterh., *E. intermedius*, Gestro, *Metopodontus cinctus*, Montr., *Rhynchophorus ferrugineus*, Ol., *Rhabdocnemis obscurus*, Boisd., *Calandra taitensis*, Guér., *Atactus deplanatus*, Boh., *Oxycephala (Xiphispa ?) chalybeipennis*, Kolbe in litt., *Brontispa froggatti*, Sharp, *Promecotheca antiqua*, Weise, *P. opacicollis*, Gestro, *P. reichei*, Baly., *Xixuthrus costatus*, Montr., *Olethrius tyrannus*, Thoms., *Stenodontes insularis*, Fairm., *Monohammus* sp., *Sessinia livida*, F., *A. collaris*, Sharp., *A. palmarum*,

Kolbe in litt., *Calirrhipis femorata*, Waterh; LEPIDOPTERA: *Levuana iridescens*, *Harpagoneura complexa*, Butl., *Tinea* sp. ORTHOPTERA: *Graeffea cocophaga*, Newp., *Anaulacomera insularis*, Stål *Theatrus pallidus*, Walk.; ISOPTERA: *Eutermes* sp.; RHYNCHOTA: *Basilocephalus thaumatonotus*, Kirk., *Aleurodicus* sp., *A. destructor*, Quaint., *Aspidiotus destructor*, Sign., *Furcaspis oceanica*, Lind.; ACARI: *Tetranychopsis* sp., *Bdella* (?) sp.

The author points out that a great many of the species are probably insignificant as regards the damage done, but he considers that it is desirable to have on record a complete list of the actual and potential pests of this important tree.

FERNALD (H. T.). **Insecticides, Fungicides, and directions for their use.** *Massachusetts State Board of Agriculture, Boston, Circ.* no. 2, 1913, 24 pp.

The author gives a comprehensive list of insecticides and fungicides, with formulae and general instructions for their use. A large number of common insect pests are mentioned, and brief advice as to treatment given.

FERNALD (H. T.). **Three common scale-insects.** *Massachusetts State Board of Agriculture, Boston, Circ.* no. 6, 1913, 10 pp., 6 figs.

The author describes the San José, the Oyster-shell and the Scurfy Scales and gives full directions for the preparation and application of the insecticides most efficacious against these pests.

WOODWORTH (C. W.). **Codling moth control in the Sacramento Valley.** *Univ. of California, Coll. of Agric., Berkeley, Circ.* no. 101, June 1913, 4 pp., 3 figs.

The fruits affected are the apple and the pear. By the use of arsenical poisons the loss can be reduced to about one per cent. or less. As the worm first bores deeply into the fruit it is suggested that the subsequent surface-feeding is the fatal operation, but so far our knowledge is insufficient to explain the reasons for the efficiency of the poison. All investigators agree that it must be applied before the larva enters the fruit. In the case of pears and autumn apples, unless this first spraying has been thorough, a second brood will also require attention in the latter part of July or early in August. Its appearance may be noted if bands of sacking are placed round a few trees and examined about the 1st and 15th of July and August. One thorough spraying for summer apples and one or two for autumn apples and pears will completely control the codling moth in the Sacramento Valley. For a single medium-sized tree, ½ pint of lead arsenate in 5 gallons of water is sufficient. For a quarter of an acre of orchard 3–6 lbs. lead arsenate in 100 gallons of water is enough. Instead of this weight of lead arsenate, one-third of zinc arsenite, or one-quarter of Paris green, may be used. In the latter case lime (three times as much)

should be added. This holds the arsenical to the tree and also marks the tree so that the thoroughness of the application may be visible to the eye.

WOODWORTH (C. W.). **The Woolly Aphis.**—*University of California, Coll. of Agric., Berkeley, Circ.* no. 102, June 1913, 4 pp., 1 fig.

Believed to be of American origin, and called "American blight" by English entomologists, this insect has now been shown to be another form of the elm aphis (*Eriosoma ulmi*).

"Northern Spy" roots have been used with great success against it in Australia, where it is a serious pest. They are equally efficient in California, and should be used wherever the woolly aphis requires combating. If nursery stock is wanted quite free from the insect, the production of winged forms in the neighbourhood of the nursery should be prevented. Elm trees should be carefully inspected in spring, and as soon as the swollen leaves become conspicuous these should be removed. Apple trees in the vicinity should be kept free from twig infestation. Should the nursery become infested, it is best to dig up and destroy everything that has been attacked, as the wingless forms may spread along the nursery rows. Though this is not the case in California, there are places where treatment is justifiable. The simplest and generally cheapest method is the direct application of kerosene or gasolene with a swab or brush. Too much oil will produce dead spots on the bark. The work is as quick as spraying, and is immediately and completely effectual. The trees should be gone over about once a week in spring until the danger of rapid increase is past. If the insects cannot be economically treated with oil, spraying will be necessary, and a nicotin spray is the best. Nicotin sulphate 40%, 1 lb., and cresol soap 1 gallon, in 200 gallons of water, form an effective solution; the soap simply increases the penetration. Spraying must be thoroughly done. There appears to be no danger of winged forms issuing from the roots, but sometimes it may be desirable to prevent the lice from migrating. The easiest method is to dig out a few shovelsful of earth round the roots and fill in with sand.

PARKER (J. R.). **The imported cabbage worm and the cabbage aphis.** —*Montana Agric. Coll. Expt. Stn., Bozeman, Montana, Circ.* no. 28, Aug. 1913, pp. 9-24, 12 figs.

The cabbage heads are rendered unsightly and unfit for a first-class market by the dark green excrement of the "imported cabbage worm" (*Pieris rapae*, L.), and if they are badly riddled, growth is stopped. It is well to plough under or otherwise destroy all cabbage stumps and leaves remaining from the crop, as they afford ideal breeding places. A few heavily-poisoned stumps may be left to act as traps. A spray, containing either Paris green, arsenate of lead or arsenite of zinc, may be used immediately there is any noticeable injury. The author says that there is no danger in eating cabbage

sprayed with arsenicals. Another cabbage worm found in Montana, the larva of the diamond-back moth (*Plutella maculipennis*), is amenable to the same measures.

The cabbage aphis (*Aphis brassicae*, L.), also uses crop remnants for depositing its eggs, and since weeds, such as wild mustard and shepherd's purse, serve as breeding places for the early generations of the lice, they should not be tolerated near cabbage fields.

A most effective spray is: Black leaf tobacco extract, 8 oz.; soap, 4 oz.; water, 4 gals. If "Black Leaf 40" is used, only 3-4 oz. need be taken. The soap makes the spray spread evenly on the waxy surface of the cabbage and makes it penetrate the mealy covering of the lice. Failing tobacco extract, a good alternative is a strong solution of soap; soap or washing powder 1 lb., and water 4 gals.; and for cauliflowers its non-staining property is a real advantage.

CLERC (G. O.). **Rapport sur une mission dans le gouvernment d'Oufa pour déterminer les insectes déprédateurs et indiquer les moyens de les combattre.** [Report of a commission in the Govt. of Oufa, for the determination of insect pests and the means of combating them.]—*Bull. de la Soc. Ouralienne, Amat. Sci. Nat., Ekaterinburg*, xxxii, no. 2, 1913, pp. 140-145.

In July 1912, the author made an expedition into the district of Oufa with the purpose of examining crops which were being destroyed by insects. In the neighbourhood of Bélébéï, the crops of wheat and oats had at first been very promising, but, as the summer advanced they were attacked by insects, and it was evident that the harvest would be reduced to anything between 50% and 0% of the usual. As the weather at the time of examination was unfavourable for finding insects, the author did not succeed in catching any adults, but he obtained a large number of pupae of *Mayetiola* (*Cecidomyia*) *destructor*, Say. and of *Oscinis frit*, L. Plants which were unattacked by these insects were often infested with Thrips.

In the district of Birsk the condition of the crops was even worse, especially in the case of wheat. APHIDIDAE, *Cecidomyia*, *Oscinis* and *Thrips* were found in abundance. Oats had suffered principally from APHIDIDAE and *Oscinis*. Fields of millet and buckwheat were unattacked. The author advocates ploughing the fields to a depth of 16-20 cms. (6·4"-8"), and burning the stubble with the roots before *Cecidomyia* and *Oscinis* emerge from their cocoons.

CÆSAR (L.). **Our most troublesome orchard insects and diseases.**—*Forty-fourth Annual Report of the Fruit Growers' Association of Ontario for* 1912, *Ontario Dept. Agric., Toronto*, 1913, pp. 13-31, 19 figs.

The title sufficiently explains the scope of this paper (see this *Review*, Ser. A, i, p. 404), in which the author also gives a list of remedies and notes on the methods of their employment.

FELT (E. P.). **The use of oils on dormant trees.**—*Twenty-eighth Report of the State Entomologist*, 1912, *N.Y. State Mus., Albany, New York, Bull.* no. 165, 15th July 1913, pp. 83-92.

The author says that the spraying of dormant trees with oils, especially mineral oils, is one of the more recent developments of insect control, and it has been said by enthusiasts that the application is harmless. He gives examples showing that there are a number of so-called miscible oil preparations on the market the careless use of which is attended with danger, and he summarises his conclusions as follows:—

The use of oils or oil preparations on dormant trees has been followed in several cases by severe injury. Trees, as living organisms, respond to climatic and cultural conditions, and as a consequence their power of resisting penetration and injury by oils undoubtedly varies with the season, and probably with age, from year to year. Since certain weather conditions promote injury by oils, it appears impossible to be sure that deleterious effects may not follow the spraying of dormant trees with an oil preparation. Autumn treatment with oil appears to be more hazardous than spring applications. Other things being equal, the author believes that there is less danger of penetration by oil, and consequent injury, if the applications are made in the spring, shortly before active growth begins, as there is then likely to be greater resistance to the entrance of oil, or more rapid renewal of necessary vital tissues that may be destroyed by it.

SHEVIREV (I.). **Oviposition in Ichneumon Flies.** *Jl. R. Micr. Soc., London*, pt. 4, Aug. 1913, p. 385.

Iv. Shevirev has experimented with *Pimpla instigator* and other species, to which he gave pupae of different sizes, *e.g.*, of *Sphinx* and of *Pieris*. If only large pupae are supplied the progeny will be almost wholly female; by supplying only small pupae, the female offspring can be practically eliminated. It appears as if the females, like queen-bees, adjusted the kind of egg laid to the nutritive conditions available. In another paper (C.R. Soc. Biol. Paris, lxxiv, 1913, pp. 698-9) the author refers to parthenogenetic females. While the fecundated females lay eggs which develop into both sexes, those laid by virgin females produce males only. In the case of the fecundated females, the eggs which produce males are unfertilised eggs.

HERRICK (G. W.). **Control of two Elm-tree pests.**—*Cornell University, Agric. Exp. Sta., Coll. Agric., Dept. Entom., Ithaca, N.Y., Bull.* 333, May 1913, pp. 491-512, 19 figs.

The author reports in detail successful operations against the elm leaf-beetle (*Galerucella luteola*, Müll.), and the elm leaf-miner (*Kaliosysphinga ulmi*, Sund.) Arsenicals were employed against the former pest and "Blackleaf 40" tobacco extract against the latter. The author recommends that in planting shade trees adjacent streets should be planted with different species, as thus an outbreak of any single pest can be easily checked and controlled.

GRAY (G. P.). **Analyses of insecticides for users.**—*University of California, College of Agriculture, Berkeley, Circ.* no. 105, Aug. 1913, 7 pp.

The California Insecticide Law provides that "the . . . Directory of the Agricultural Experiment Station of the University of California shall, upon the receipt of a sample of the insecticide, accompanied by a nominal fee of one dollar, furnish to the user of the said commercial insecticide, such examination or analysis of the sample as will substantially establish the conformity or non conformity of the said insecticide to the guarantee under which it is sold."

It is pointed out that a complete analysis will not usually be made, but only such an examination or analysis as will fulfil its object, and also that analysis will not be made for dealers. The great care which is necessary when drawing a sample is specially insisted on.

WOODWORTH (C. W.). **The Amended Insecticide Law.** *University of California, College of Agriculture, Berkeley, Circ.* no. 104, Aug. 1913, 10 pp.

This pamphlet gives the full text of the law of 1911 enacted in California, as it now stands, with footnotes commenting on each of the changes.

GEHRMANN (K.). **Krankheiten und Schadlinge der Kulturpflanzen auf Samoa.** [Diseases and pests of cultivated plants in Samoa.] *Arbeit. k. biol. Anst. Land- und Forstwirtschaft, Berlin*, ix, no. 1, 1913, pp. 1-120.

The rhinoceros beetle (*Oryctes rhinoceros*) is the chief insect pest of coconut palms in Samoa. The palm-borer (*Rhynchophorus ferrugineus*) which is found throughout the Indian Archipelago, and also in New Guinea, the leaf-eating coco moth (*Levuana iridescens*) and the dreaded coco scale-insect (*Aspidiotus destructor*) are all, at present, absent from Samoa. After discussing at some length the possibilities of combating the rhinoceros beetle, the author gives the instructions issued by the Government in the Straits Settlements and in Singapore in connection with this pest, which may be briefly summarised as follows:—All infested trees are to be burnt or buried, or sunk in water, so that the eggs, larvae, pupae and beetles will be destroyed. Anyone keeping on his land dead coconut palms, etc., which would harbour the beetle, is to be fined: and Government officials shall be allowed to enter gardens and plantations for the purpose of seeing that the instructions are carried out.

There seems to be no direct method of combating the pest. The danger for Samoa lies in the fact that the beetle has only recently been introduced; it is likely, therefore, to multiply considerably, and Samoa offers every condition favourable to its spread.

Carpenter (G. H.). Injurious Insects and other Animals observed in Ireland during the year 1912. —*Econ. Proc. R. Dublin Soc.*, ii, no. 6, Aug. 1913, pp. 79-104, 9 figs, 2 pls.

Grubs of the Garden Chafer (*Phyllopertha horticola*), were received in September from Co. Galway, where it is said that they do the greatest damage to "second grass." Rooks were observed to pull up the dead plants in order to get at the grubs. Specimens of the Frit Fly (*Oscinis frit*) were received from Co. Dublin. Turnips, with the sub-globular galls due to the maggots of the Root-gall Weevil (*Ceuthorrhynchus pleurostigma*, Marsh.), were received in March from Co. Galway, and in April, from the neighbourhood of Belfast. Cabbage and cauliflower plants were received from Co. Clare, the stems of which were bored by a somewhat large Curculionid grub, not yet identified. The injury ultimately kills the plants. The only measure that can be recommended is the removal and burning of the infested plants. Specimens of the Potato-leaf Beetle (*Psylliodes affinis*) were received from Co. Tipperary and Co. Kerry. In Ulster, the Flax Flea-Beetle was very active in 1912; spraying with lead arsenate is suggested. Specimens of small white Annelid worms, of the family *Enchytraeidae*, were received from Co. Monaghan, with the statement that they were injuring celery, carrots, parsnips, and onions. They have been identified as *Enchytraeus albidus*, Henle, which is very common in farmyard manure. Celery roots were sent in February from Co. Down, tunnelled by the maggots of the Carrot Fly (*Psila rosae*), proving that they can live through a mild winter. One sample of apple shoots sent from Portadown, was found on 29th May to be infested with *Aphis pomi*, *A. sorbi*, *Psylla mali*, and caterpillars of the Winter Moth (*Cheimatobia brumata*) and of a species of *Tortrix*. Later on, more *Aphis sorbi* were sent from Counties Antrim, Waterford, and Dublin, and *Aphis opmi* from Waterford and Tipperary. In July an apple shoot especially badly infested by the Woolly Aphis was received from Co. Limerick. The Apple Sucker (*Psylla mali*) did a vast amount of damage to apple blossoms in May 1912. Specimens of shrivelled buds containing the insects were received from Counties Dublin, Kerry, Armagh, and Tyrone. In some cases the hairy black fly, *Bibio marci*, was noticed in numbers around the injured blossoms and was wrongfully accused of causing the damage. Specimens of the ruddy Shield Bug, *Acanthosoma haemorrhoidale*, were sent, in February, 1912, from Co. Cork, where they were sucking the unopened buds of apple trees. From Rathfarnham specimens of the Clay Vine Weevil (*Otiorrhynchus picipes*) were received, with information that the young black-currant bushes were badly damaged; entire shoots were sometimes devoured. *Phyllobius oblongus* and *P. viridiaereus* are recorded as damaging apple foliage.

Caterpillars of the Winter Moth (*Cheimatobia brumata*) were very abundant in many parts of the country, feeding on apple, plum, currant, and gooseberry. Apple shoots disfigured by the webs of the Small Ermine Moth (*Hyponomeuta malinellus*) were received in April and May from Co. Dublin. Apples bored by the caterpillars of the Codling Moth (*Cydia pomonella*) came from Co. Clare in June. Caterpillars of the Common Bell Moth (*Tortrix ribeana*) were found in May eating apple shoots in Co. Dublin. For their destruction early spray-

ing in April with lead arsenate wash is recommended. Apples containing larvae of the Apple Sawfly (*Hoplocampa testudinea*) were received from Counties Tyrone, Tipperary and Kildare. The Pear Gall Mite, *Eriophyes pyri*, and the Black Currant Gall Mite, *E. ribis*, were reported, the former from Co. Dublin, the latter from Co. Kerry. The acclimatisation in Ireland of the Australian Fern Weevil (*Syagrius intrudens*) is recorded; ten years ago it was extremely destructive to ferns in the Royal Botanic Gardens, Glasnevin, and now it is breeding in the open.

PICARD (F.). **Sur un Braconide nouveau parasite de *Sinoxylon sexdentatum*, Ol., dans les sarments de vigne.** [On a new Braconid parasite of *Sinoxylon sexdentatum*, Ol., on vine shoots.]—*Bull. Soc. Entom., France, Paris*, no. 16, 1913, pp. 399-402, 1 fig.

Sinoxylon sexdentatum is the most common Bostrychid in the South of France; it is found in vine branches, which it reduces to a state of dust. Many enemies of this insect are known; some predaceous, such as Histerids, Malachiids, and Clerids; others parasitic, such as the Acarid, *Pediculoides ventricosus*, and the Proctotrypid, *Cephalonomyia formiciformis*. The author is the first to record a Braconid parasite of this beetle. The species which he describes is new, viz., *Monolexis lavagnei*, and was taken in large numbers from *S. sexdentatum* infesting vines. The insect is not exclusively parasitic upon *S. sexdentatum*, but has been found in connection with *Scobicia pustulata*, F., and *Xylonites praeustus*, Germ. It may also attack Scolytids.

SCHALVINSKY. **Непарный шелкопрядъ въ Лебедянскомъ лѣсничествѣ.** [*Lymantria dispar* in the Lebediansk Forest (Govt. of Tambov)]. **«Лѣсная жизнь и Хозяйство»** ["*Forest Life and Economy*"]. *Published by the Tambov Administration of Agriculture and State Domains, Tambov*, 1913, no. 5, pp. 9-14.

The Matiushin estate of the Lebediansk forest has frequently been visited by *Lymantria dispar*, especially those plots where oak plantations are more or less mixed with birch and aspen, and where the "tchornosiom" soil is covered by a rich growth of grass. The age of these attacked plots is 40-80 years, the thickness of the trunks from 0·6 to 0·8 metre. The insect practically avoids young plantations up to 20 years old, as well as thin plantations or glades. They also seem to avoid light, usually starting to eat the foliage on the windward side and in places where the trees are dense. The larvae emerge from the eggs in the middle of April, and pupation usually begins from the 13th to 26th June. Should there be rain and a change to cold weather, the larvae perish without pupating. The pupae are found on the branches and trunks, and a month later (13th-26th July) the perfect insects appear. The females oviposit in the lower cracks of the bark, laying their eggs in groups of 20-50, and the moths disappear in the middle of August.

The author describes the result of destroying the unhatched eggs by scraping, burning, or scattering them. These remedies invariably

gave only partial results, as some of the eggs developed even in unfavourable positions. According to Shevirev, *L. dispar* is seldom dangerous in natural forests, and he recommends fighting the insect only in natural woods growing under unfavourable conditions, or near plantations, nurseries or orchards; in any case, he recommends smearing the egg-masses with naphtha. The author gives an example of the cost of this remedy, which, including peasant women at 20 copeks (5d.) a day, and naphtha, of which about 32 cwt. were used, amounted to about 5d. per acre. On the plots that were most thoroughly treated there were no unhatched eggs. The results showed that in these spots there were practically no caterpillars in the spring of 1912, and no damage to the leaves. In the neighbouring plots, which were not smeared, the insects appeared in more or less large quantities, and would have done great damage if the weather conditions had not arrested their development. The author is quite satisfied as to the efficiency of this remedy.

BAGRINOVSKY (.). **Отчетъ о борьбѣ съ вредными насѣкомыми въ Куликовскомъ Лѣсничествѣ Тамбовской губ. за 1912 годъ.** [Report on the fighting of injurious insects in the Kulikov Forest of the Govt. of Tambov in 1912].—**«Лѣсная жизнь и Хозяйство»** [*"Forest Life and Economy"*].—*Tambov*, 1913, no. 5, pp. 31-35.

As the result of excavations conducted by Prof. I. K. Tarnani in autumn of 1911, he was satisfied that the year 1912 would be a bad year for *Melolontha* on the Kulikov estate, while on the Demshin estate this was to be expected only on one plot. These expectations proved correct, and the "May beetles" on the former estate appeared in enormous numbers. The author further describes the collection of the beetles organised on about 13,500 acres of the Kulikov estate, and on 12,000 acres of the Demshin estate, which resulted in the accumulation of 15 tons of insects, for which a sum of £200 was paid; 961 people, mostly women and children, were engaged in the work, which lasted from the 2nd June to 6th July. The beginning of field and market-garden work, as well as the decrease in the number of flying beetles, led to a gradual diminution in the quantities collected after the 29th June; the amounts brought in varied from $3\frac{1}{2}$ cwt. to 14 cwt. per diem before the 16th June, after which date the daily collections were never more than 268 lb., being only 9 lb. on the 23rd of that month. For each pound of live beetles from $\frac{3}{4}$d. to $1\frac{1}{4}$d. were paid. The procedure adopted was to shake the trees, when the beetles fell down and were collected in bags, etc. The bags containing the insects were put into boiling water, after which they were emptied into deep pits. In order to check the stench produced by the dead bodies of the beetles, the heaps were sprayed over with lime. It is estimated that at least seven and-a-half millions of females were destroyed.

Some experiments were also started to test the effect of various insecticides, Paris green, barium chloride, and white arsenic, on young seedlings. Underneath some small oak bushes sprayed with Paris green or barium chloride no dead beetles were found, and the insects evidently avoided these plants.

ZHITKOV (GR.). **Работы 1912 г. Фащевскаго опытнаго лѣсничества по изученію майскаго жука** [Studies on *Melolontha* in the Fastchevsk experimental forest, Govt. of Tambov, in 1912.] — **«Лѣсная жизнь и Хозяйство»** [" *Forest Life and Economy*"]. — *Tambov*, 1913, no. 6, pp. 6-17, no. 7, pp. 4-17, and no. 8, pp. 18-25.

The Fastchevsk forest was formed principally in order to study the best means of fighting *Melolontha*, which is the most serious pest of pine forests. In 1912, owing to the cold weather prevailing, the flying of the beetles was noticed only on the 13th May at an air temperature of 1·4°C. (34·5°F.) and a soil temperature of 0·2°C. (32·3°F.); on the 14th May the temperature fell again, and not until the 19th May, when the weather became definitely warmer, did the flight in great masses begin. The author describes first the results of the collection of beetles *en masse*; about 564 poods (181 cwt.) of insects were collected and destroyed. For each pound of insects collected five kopeks (1¼d.) were paid, and on some days as many as 24 cwt. were brought in. Only specimens of *Melolontha hippocastani* were obtained, in two varieties, one with dark legs and black scutellum (this being in the majority), and another with pale legs and reddish scutellum. No specimens of *Melolontha vulgaris* were found. With regard to oviposition, observations have shown that the females avoid bare places, though bare fallow is not an absolute protection against oviposition, and that the females dig holes for their eggs in places not exposed to the rays of the sun, the eggs not being able to develop in dry soil. In such exposed places there are no plants, the appearance or smell of which would prevent the female ovipositing near them; rye alone seemed not to be favoured by them.

Experiments conducted to show whether the insects can fly for long distances did not prove conclusive, for no marked beetles were recaptured. The insects are not attracted by light.

The author refers to the statement that white alder grown in nurseries will protect them against the insects, but on one plot on which alders were sown in 1910-11, the insects appeared just as usual. Observations are still required as to how the larvae behave towards the roots of alders, and how it is that this tree withstands their attacks. Experiments as to the effect of various insecticides in protecting the roots of trees from the larvae were made, and Paris green, arsenic, barium chloride, naphthalin and tobacco dust proved harmless to the young seedlings, except Paris green, when used in a proportion of more than 3½ drams in 2·7 gallons of water, and naphthalin in a proportion of ½ lb. or more in the same quantity of water. The plots in which the surface of the roots had been poisoned with these insecticides were afterwards artificially infected with larvae of *Melolontha*, in one case also those of *Serica*, but no damage was noticed in the autumn of 1912; these experiments are to be repeated in 1913. As to the supposed preventive influence of straw and dry oak leaves, the experiments did not prove conclusive, although they produced no evidence against these remedies. The author is not satisfied that birches ought to be excluded from pine plantations; although they no doubt serve as food for the insects, the same applies also to every young tree with tender leaves:—oak, ash, lime, hazel, and sorb. The author con-

tradicts the statement that the collection of the beetles cannot be considered sufficient and effective; he believes that the remedy, if applied, not as an experiment, but on a large scale and *everywhere* in the Government will yield good results, and that only after several years of such collection will it be possible to judge conclusively as to its efficiency. He further describes the result of digging the earth, in order to ascertain the numbers of eggs, larvae, pupae, and adults wintering in the soil. A table is given showing the result of the examination of 1,625 holes, each one metre square. In July and August the soil was dug out to the depth of 1 metre; in September and October, to a depth of $1\frac{1}{4}$-$1\frac{1}{2}$ metres. It appears from the table that the collection of beetles was by no means useless, the number of eggs and young larvae in those places where collection was practised being generally less than one-third of that in places where no collections where made; though in both cases an equal number of larvae of older stages (not bred in 1912, but before) were found. Keeping the soil friable decreases the number of larvae; crop-growing on spots where the trees are cut away also gives positive results; in sandy soil the larvae are fewest, next coming pine woods, and then spaces that have been cleared of trees; the heaviest infestation is in soil around deciduous trees; old trees are preferred by the females to younger ones, if both grow together on the same spot; floods from the river Dvuretchka had no influence on the larvae. The author recommends the digging of holes yearly, and on a large scale, to obtain more reliable information as to the present and future occurrence of the beetles.

In conclusion, the author gives an account of various experiments, from which it appears that the larvae require moisture for their development, perishing in dry soil; that they perish in close, compact soil; that in the presence of food in the soil the larvae move about three inches in 24 hours, while in the absence of food the speed is about four inches; some experiments in a special glass apparatus showed that the insects could move as much as two feet in 24 hours. Further observations of this kind are in progress.

K.T. **Вредители и борьба съ ними въ лѣсничествахъ Тамбовской губ. въ 1912 г.** [Pests and the fighting of them in the forests of the Government of Tambov in 1912].—**«Лѣсная жизнь и Хозяйство»** ["*Forest Life and Economy*"].—*Tambov*, 1913, no. 7, pp. 25-28.

The fighting of injurious insects was conducted in 1912 in sixteen forests of the Government, being chiefly directed against the "May beetles" (*Melolontha*), which are the most widespread and dangerous pests of forests. In nine forests the whole fight was concentrated on the collection and destruction of these beetles, the total quantity of insects destroyed being 25 tons. The insects were mostly killed in boiling water, but in one forest special ovens were dug in the earth. In another forest the beetles were boiled in water to which lime was added, and afterwards used as manure for nurseries for 1913. It was noticed that in one locality where the plantations were eaten totally bare in 1907, the previous flying year, this year they were only partly

damaged. The excavations conducted later proved that in mixed forests, plantations of young oak, birch and aspen, suffered only one-third of the injury done in pure oak plantations, when no collections were made in either. As preventive measures against oviposition by the insects, light harrowing of the soil and spraying of tobacco dust in the nurseries were tried. The latter gave no useful result.

Apart from *Melolontha*, operations were also directed against *Euproctis chrysorrhoea*, *Lymantria dispar* and *Lophyrus pini*, the larvae of which were collected and destroyed. The larvae of *Notodonta trepida* were swept by brooms from the trees and collected afterwards into pits. The larvae of *Retinia* were destroyed by cutting away the branches from the point at which they had started to penetrate, and burning them.

Notice of Public Hearing on the Alligator Pear Weevil (Coleop).—*Entom. News, Philadelphia*, xvix, no. 9, Nov. 1913, p. 416.

In an editorial note attention is drawn to a meeting that was to be held at the Agricultural Department, Washington, during November, to discuss the question of establishing a quarantine against avocado seeds and fruits imported into the continental United States. It appears that a dangerous enemy to avocados (alligator pears) known as the avocado weevil (*Heilipus lauri*) exists in Hawaii, Porto Rico, Mexico, and other foreign countries. The weevil lives in the seed of the avocado, and no method is known by which it may be killed without destroying the seed itself. In view of the increase of avocado culture in the United States, especially in California, it is hoped that the nvestigations now being made will lead to the discovery of a method of treatment.

SCHNEIDER-ORELLI (O.). **Der gegenwärtige Stand der Reblausforschung.** [The present state of research upon Phylloxera.]—*Schweiz. Zeits. für Obst-und Weinbau, Frauenfeld*, xxii, no. 21, 10th Nov. 1913, pp. 321-325.

This paper gives shortly the work of Börner, which forms a continuation of the researches made recently in Italy and France upon the life-history of the vine louse (*Phylloxera vastatrix*.) The work upon the subject by Marchal and Feytaud is given fully in the "Revue de Viticulture" (vol. xi, p. 5). The present paper shows that the winged louse and the gall-louse, in the majority of cases, play no part in the spread of the pest on European vines; and that the wingless root-louse can multiply indefinitely, giving rise to numerous generations without the intervention of a sexual generation, as occurs in American vines.

MARCHAL (P.). **Contribution à l'étude de la biologie des *Chermes*.** [Contribution to the study of the biology of *Chermes*.]—*Ann. Sci. Nat. Zool., Paris*, xviii, nos. 3-6, 1913, pp. 153-385, 6 pl., 74 figs.

The author has made numerous observations and experiments to ascertain the life-history of four species of *Chermes*, viz. *C. nusslini*,

C. piceae, *C. pini*, and *C. strobi*, the host tree of the first two being the fir, and of the last two, the pine. As regards *C. nusslini*, the author finds that it undergoes an alternation of hosts between *Picea orientalis* (not *P. excelsa*, as had been held before) and *Abies*; while *C. piceae*, which until recently was taken to be the same as *C. nusslini*, passes its whole life-cycle on *Abies*. *Chermes pini* was thought to reproduce indefinitely by parthenogenesis on the pine; but sexual reproduction taking place on *Picea excelsa*, has been discovered by Cholodkovsky. Galls of a species of *Chermes*, now thought to be *C. pini*, have been found on *Picea orientalis* in the south of Europe; recently, in the neighbourhood of Paris where *P. orientalis* is abundant, the author was able to trace the sexual generation of *C. pini* on this tree. *C. strobi*, which has been imported from America, multiplies in Europe exclusively by parthenogenesis.

Bentley (G. M.). **Bee-keeping in Tennessee.**—*Tennessee State Board Entom., Knoxville, Bull.* no. 9, June 1913, 64 pp., 56 figs., 2 sketch maps.

This booklet deals very completely with bee-keeping in Tennessee. Bee-moth is stated to be the chief of the troubles of the bee-keeper, which, in diminishing degree of importance, comprise paralysis, foulbrood, ants, cockroaches, toads, mice, and birds. The presence of bee-moth implies carelessness, for it never attacks a strong vigorous colony.

Gillette (C. P.) and Weldon (G. P.). **The fruit tree leaf-roller in Colorado.** *Fourth Annual Report of the State Entomologist of Colorado, Fort Collins, Colorado, Circ.* no. 7, Sept. 1913, pp. 30-67, 9 figs.

The female moth (*Archips argyrospila*, Walk.) deposits her eggs in compact oval clusters of from twenty-five to more than one hundred. The first larvae emerge with the bursting of the apple leaf buds, and when the blossom buds begin to show their pink colour the eggs are nearly all hatched. The apple is chiefly attacked. Plum, cherry, and pear trees suffer less, and the peach is practically immune; but when food is scarce the larvae will attack any green foliage. The history of the leaf-roller in the Cañon City Section is then given by A. S. Taylor. First noticed in the spring of 1908, its ravages rapidly increased, and according to data available in August 1912, the crop on the south side of the river was damaged fully 85 per cent. The north side promised nearly a full crop, but was found to be badly damaged at picking time. The eggs were not destroyed by very strong solutions of lime and sulphur used in 1910 and 1911; 7 lb. of lead arsenate in 100 gallons of water could not save the fruit, though it saved some of the foliage; miscible oil seems to have solved this serious problem at last.

The main report then continues with a comprehensive list of insecticides, tables of the insectary experiments carried out with them, and detailed notes to supplement the tables. These experiments resulted in the following conclusions :—

(1) Leaf-roller eggs possess a remarkable resistance to injury by practically all well-known contact sprays; (2) lime and sulphur preparations, either home-prepared or of commercial manufacture, give little, if any, benefit, even when used in excessive strengths; (3) kerosene emulsion containing 16⅔ per cent. oil, or more, usually kills the eggs, but under certain conditions, which cannot be explained, higher strengths may fail to do so, on the other hand, a weaker strength will often do the work well; (4) a thick coating with a lime whitewash will keep the larvae from emerging from the eggs; it must be sufficient to cover the surface of the egg mass entirely; (5) "Black Leaf 40," "Nicofume," and other tobacco preparations, used alone or with soap, were of no value; (6) strong arsenical sprays used to coat the egg-masses may be of some benefit, but probably not enough to justify their use; (7) whale-oil soap, lye, corrosive sublimate, Cooper's "V. Tree Spray," "Aphine," and hydrocyanic acid gas gave little or no protection.

Abundant notes of orchard experiments follow. From them the authors conclude that:

(1) The leaf-roller eggs may be killed by a very thorough spraying with a soluble oil while the trees are dormant; this spray should probably be applied prior to, but as near hatching time of the eggs as possible; (2) very careful and heavy spraying with arsenicals early in the season will result in almost complete control; the first application should be made shortly after the eggs begin to hatch, which will be when the first green foliage is showing on the trees, and the second as soon as the blossom buds have separated in the clusters; a blossom spray is, in all probability, not necessary, and is dangerous, in that it poisons the bees; (3) "Black Leaf 40" carefully and thoroughly applied about the same dates as the first two sprayings with arsenicals, will give good results; (4) a mixed spray of "Black Leaf 40" and lead arsenate is little more satisfactory than either one of the insecticides used alone; furthermore, the cost of such spray would be too great for practical purposes; (5) 3 lb. lead arsenate to 50 gals. of water is sufficient for successful control, and there is no advantage to be derived from mixing Paris green with it, as many have done; (6) not less than ten gallons of spray, on an average, should be applied to trees from twelve to twenty years of age; very large trees may require even more; (7) failure to control this pest with arsenicals has been due in most cases either to a failure to spray early enough and at the correct time, or to put enough of the liquid on the trees.

Moore (H. W. B.). **The Planters' Insect Friends.**—*Timehri, Jl. R. Agric. Comm. Soc. Brit. Guiana*, iii, no. 1, Sept. 1913, pp. 35-42.

An account of the insect pests which attack sugar-cane in British Guiana and the various parasites which prey upon them. A paper on the same subject by Mr. G. E. Bodkin has recently been noticed in this *Review* (vol. i, ser. A, p. 139).

BARTHOU (—.). **Les Ennemis du Framboisier.** [Enemies of the raspberry cane.]—*Moniteur d'Horticulture, Paris*, xxxvii, no. 21, 10th Nov. 1913, pp. 248-249.

The stem of the raspberry is frequently attacked by the daddy-long-legs (*Tipula oleracea*). The larva, known as the leather jacket, devours the stem not only of raspberry canes, but of strawberries, vegetables and flowers. Carbon bisulphide may be used as a remedy, also gas-lime. The best method is said to be to collect the larvae in the neighbourhood of the plant. This should be done in the early morning when they come out to feed. Spraying with water and gas-oil emulsion is effectual, but it has the disadvantage of destroying the leaves of the plant.

Another insect attacking the raspberry is *Lasioptera obfuscata*, Macq., which produces galls on the stems, full of reddish-coloured larvae. The remedy is to cut off and burn the excrescences. The leaves are often attacked by the caterpillars of *Polia oleracea*, L. The canes should be sprayed at their base with a concentrated solution of sulpho-carbonate of potassium; a trial spray must be made first to ensure that the concentration is not such as to harm the plant.

MOREAU (L.) & VINET (E.). **Au sujet de l'emploi des pièges à vin pour capturer les papillons de la Cochylis.** [On the use of wine-traps for capturing *Clysia ambiguella*.]—*C. R. Acad. Sci., Paris*, clvii, no. 23, 8th Dec. 1913, 1158-1160.

The traps consist of simple glasses, 8 cms. (3·2 inches) deep and 6 cms. (2·4 inches) in diameter at the orifice. They are provided with a plate of glass 9 × 12 cms., which forms a roof, and which is held above by a piece of iron wire, which serves also to suspend the traps between the vine plants. The liquid consists of wine lees, to which is added vinegar, one part to ten of wine. The glasses are three-quarters filled. The capture of the moths of *Clysia* by means of these traps is influenced by atmospheric conditions, and does not give, according to the writers, satisfactory results, in spite of the numbers, which show that 2,289 moths were caught in thirty-one traps. It does not appear to constitute a sufficient means of control, and can only be regarded as complementary to other methods.

THOMPSON (W. R.). **Sur la spécificité des Parasites Entomophages.** [On the specialised habits of parasites of insects.]—*C. R. hebd. Soc. Biol., Paris*, lxxv, no. 35, 12th Dec. 1913, pp. 520-521.

The operation of parasites in keeping harmful insects under control has been a considerable asset to agriculturists during the past few years. There is a tendency, however, to attribute to particular parasites too great a power of becoming acclimatised to new surroundings into which they have been artificially introduced, and the author points out that parasites are often sharply restricted to particular hosts. Also, since many undergo an alternation of hosts, the introduction of such parasites into new countries becomes still more complicated.

The author cites a case of two closely allied weevils, which are parasitised by different insects; these are *Hypera postica*, Gyl., and *H. punctata*, F. The former is infested by several parasites, among which nine are frequent and easily distinguished; three attack the eggs and six (including a fungus) the larvae and pupae. *Hypera punctata*, on the contrary, is only parasitised by three species, even when it is in the same fields as *H. postica*; these three are a Mymarid egg-parasite, a fungus, and an Ichneumon parasite of the larvae. The first two are also parasitic upon *H. postica*; the last is a specific parasite of *H. punctata*.

GIRAULT (A. A.). **Notes on a Plague of Locusts in North Queensland, and its Relation to Sugar Cane.**—*Societas Entomologica, Stuttgart*, xxviii, nos. 11 & 12, 31st May and 14th June, 1913, pp. 45-46, 49-50.

Between January and June, 1912, the author made a series of observations upon the locust (*Locusta danica*) in North Queensland. In January adult specimens were observed in swarms, apparently attracted by the lights in houses. Later in the month, at Innisfail, from the bank of the Johnstone river, quite a large progressive flight was witnessed; in an adjacent sugar plantation most of the plants withered on the next day, the leaves having been stripped of their mid-ribs. In February, the young were noticed, and at the same time many dead adults, mostly females, were found. These were found while ovipositing, with their abdomens half-buried in the earth. These adults were no doubt the last of the migrating swarms observed in January. In March the adults of the first generation were very abundant, and also all larval stages, but in April all had reached maturity. At this time injury to cane was noticeable and rather extensive. In April, eggs of some locust, probably those of *L. danica*, were found, and an egg-parasite (*Scelio ovi*, Girault M.S.) was reared from them. Later, this parasite, together with another species (*Scelio australis*, Froggatt), known to be parasitic upon the eggs of *L. australis*, was found in company with the locusts. In May and June, *L. danica* were rare, although larvae of *australis* were seen in colonies.

MARCHAL (P.). **Contribution à l'etude de la biologie du Puceron noir de la Betterave.** [Contribution to the study of the biology of the Black Aphis of Beetroot.] *C. R. hebd. de l'Acad. des Sciences, Paris*, clvii, no. 22, 1st Dec. 1913, pp. 1092-1094.

The life-history and occurrence of *Aphis euonymi* have been given by Mordwilko. He was of the opinion that this insect, which causes extensive damage to beetroot plantations, had two plant hosts during its life-cycle—the beetroot and *Viburnum opulus*, L. or *Euonymus europaeus*, L., and that by destroying the latter trees in the neighbourhood of beet plantations, the pest could be got rid of. The present author has made further observations at Orleans and at St. Germain-des-Prés, and has found that there are yet other alternative hosts besides the two mentioned above, viz., Fusain de Japon, *Rumex*, *Chenopodium* and other wild plants, so that destroying the *Viburnum* or *Euonymus* is by no means a sufficient remedy. Moreover, the

author found that in certain cases the insect may complete its life-cycle on one or other of its hosts alone, so that although the pest may be reduced by destroying one of the host plants, it will not necessarily be exterminated altogether.

JARVIS (E.). **Notes on the Bean Fly** (*Agromyza phaseoli*).—*Queensland Agric. Jl., Brisbane*, Feb. 1913, pp. 124-125, & Mar. 1913, pp. 192-195, 2 pl.

French beans in Southern Queensland are subject to the attack of the bean fly, which is widely distributed in the Colony and does considerable damage. The female oviposits in the leaf, and the larva, when hatched, tunnels its way towards the leaf-stalk; pupation takes place in the swollen bases of the leaf-stalks.

Two small hymenopterous insects have been bred from the bean fly in sufficient numbers to suggest that they are doing considerable control work. Regarding artificial remedies, it is recommended to grow a small crop of Canadian Wonder beans to meet the first brood of flies; if found to be harbouring grubs they should be pulled up and burned without delay. All old bean plants that have ceased to be profitable should be rooted up and burned. The stems may be protected by earthing them up. It has been said that good results have been derived from growing beans in a shallow trench and applying to the soil, so as not to touch the plants, whitewash made from acetylene refuse [see this *Review*, ser. A, i, p. 191,] or lime slaked with water containing carbolic acid.

JARVIS (E.). **Pumpkin Beetles and how to destroy them.**—*Queensland Agric. Jl., Brisbane*, May 1913, pp. 326-333, 2 pl.

Cucurbitaceous plants, which would otherwise do exceedingly well in Southern Queensland, are subject to the attacks of insect enemies, which devour the foliage and flowers and frequently kill both seedlings and young plants. The worst of these insects is the Banded Pumpkin Beetle, erroneously called the "Pumpkin Ladybird" (*Aulacophora olivieri*, Guérin). Although especially partial to the leaves and flowers of cucurbits, they are found on other trees and shrubs, and doubtless have a wide range of food-plants. In 1908 they were recorded as having seriously damaged ripe cherries in New South Wales. They have also been known to destroy apples by biting through the stalks of the young fruit and causing them to fall.

At times they are present in thousands on a single pumpkin plant, a fact not to be attributed, according to the author, to gregarious habits, but to the conspicuous colouring of the beetle itself, which would attract others of its kind. The pest has been recorded in Queensland from various localities in the districts of East Moreton, Wide Bay, Burnett, Darling Downs, Port Curtis, Cook, Warrego, Leichardt, and Burke. In 1907 it was especially harmful in Southern Queensland during November; but the most serious outbreak occurred two years later, when the insect did enormous damage over a wide area of the State.

The eggs, which are yellow and large enough to be plainly visible, are laid on the surface of damp soil or immediately under it among

grass, roots, etc. The egg stage occupies from nine to ten days, the larval stage forty-one days (from 14th March to 24th April). The pupal stage is passed in the soil in an egg-shaped chamber excavated by the larvae at depths varying from one to three inches. Shortly before pupation the larvae are found to be tunnelling the bases of the leaf-stalks and boring the main stem.

Various remedial measures are suggested. The protection of the young plant is very important, as at this stage it is liable, in a few hours, to be greatly injured or even killed by a single beetle. They may be protected by covering them with mosquito-netting until they have begun to grow vigorously. Such covers can be supported by pieces of fencing-wire, bent to the shape of half circles, or more simply by a few short sticks stuck into the ground. The edge of the netting should rest on the earth, and be covered with a layer of soil to prevent displacement by wind, and to stop the beetles from crawling under it. A piece of crumpled paper hung over a young plant and supported by a stick driven into the ground at an angle, is asserted to keep the insects off by its movements in the wind. Plants should be systematically examined in the spring, and any beetles found should be killed by hand-picking. Among chemical substances which may be applied to deter the insects are mentioned the following: (*a*) refuse of acetylene gas manufacture ; (*b*) ammoniacal gas water ; (*c*) plaster or lime impregnated with turpentine, kerosene or phenyl ; (*d*) tobacco dust ; and (*e*) Vaporite Strawson, "aperite," or other such substance containing naphthalene. These in each case should be sprinkled on the ground around the growing plant, but away from the stem, and only in such amount as to bestow a marked odour upon it.

The following poisons have been advocated from time to time, and have proved more or less serviceable : (*a*) spraying the leaves with lead arsenate (1 lb.) or Paris green and lime (¼ lb. of the arsenical to ½ lb. lime) in every 50 gals. water ; (*b*) dusting the foliage with Paris green (1 lb.) mixed with flour or road dust (20 lb.) or with flowers of sulphur (one part) and lime (three parts).

When the insects occur in large numbers, it is recommended to shake them from the foliage into shallow pans containing a little water and kerosene. This method is best practised in the early morning or during a spell of cold weather, when the beetles are inactive and less inclined to fly.

In some cases the covering of young seedlings could be avoided by raising the plants in cold frames, so as to get them transplanted and well established before the first beetles appear. Old plants should be pulled up to avoid any possibility of the roots affording food for the larvae.

Other species recorded as damaging cucurbitaceous plants are the Plain Pumpkin Beetle (*Aulacophora wilsoni*, Baly), the Northern Banded Pumpkin Beetle (*A. cartereti*, Guérin), and the 28-spotted Ladybird Beetle (*Epilachna 28-punctata*, Fabr.) The remedial measures given for *A. oliveri* apply equally to these insects.

Insects Injurious to Papaw Apples in Queensland.—*Agric. Jl., Brisbane,* July 1913, pp. 33-35.

The following observations were made during July 1913, on insect injury to papaws:—

In West Cleveland a number of orchards were visited, all showing signs of injury; fine trees had their top leaves drooping and dead, or the main stems defoliated, and carrying a few small discoloured fruits clinging to the blackened crowns. An examination revealed the injury to be due to the presence of the larvae of *Dichocrocis punctiferalis*, which had bored into the main stem, leaf-stalks and fruit. The same species was further discovered to be injuring oranges and bananas.

The egg is deposited on the leaf-stalk near its point of junction with the main stem, or more rarely on the small fruits. The larva, when hatched, penetrates the hollow stalk and after feeding for a time on its succulent base, bores into the crown, in which it remains until ready to pupate.

Remedial measures must be of a preventive nature, as it is too late to do much good after the larvae have entered the leaves or main stem. The unprofitable food-plants of the species should be destroyed in the vicinity of the orchard, but on the other hand they should be encouraged in other parts. Spraying papaws with arsenate of lead (1 lb. to 50 gals. water) would poison newly-hatched larvae attempting to enter the plant; this should be done just before the eggs are laid, and directed principally against the early broods. All infested fruit such as peaches, etc., should be gathered and destroyed.

The food-plants of the insect already recorded are the peach, papaw, orange, loquat, guava, custard apple, granadilla, banana, millet, maize, cassia, senna bean, *Canavallia indica*, dahlia, and castor-oil plant.

Annual Report of the Bee-Keepers' Association of the Province of Ontario, 1912.—*Ontario Dept. Agric., Toronto,* 1913, pp. 72.

The various papers read at the annual meeting on November 13th, 14th and 15th, 1912, include such subjects as Federal Legislation regarding bee diseases; inspection of apiaries in Ontario; management of outlying apiaries; moving outfit on motor truck; preparing bees for outdoor wintering; cellar wintering and spring management; bees, poultry, and fruit; bee-breeding.

FULLAWAY (D. T.). **A New Species of Mealy-bug Parasite** (*Aphycus terryi*).—*Proc. Hawaiian Entom. Soc.* 1911-1912, *Honolulu,* ii, no. 5, July 1913, p. 281.

The new parasite described was bred from *Pseudococcus saccharifolia* at Olowalu and Hana, Maui, by F. W. Terry, June 1909, and at Hilo, Hawaii, August 1912, by O. H. Swezey.

WILSON (H. F.). **Combination sprays and recent insecticide investigations.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.,* no. 3, N.S., 1913, pp. 9-17.

Details and results of spraying experiments are given in this paper.

The author states that the factors which led to the study of the subject are:—(1) It is the most important problem before the farmers and fruit-growers of to-day; (2) for some one or more reasons not clear to us, our knowledge of sprays and their effects is very unsatisfactory; (3) while our commercial insecticides are more or less stable under certain ideal conditions, the results obtained from their use are too variable for us to make definite regulations; (4) the economy of spraying and the numerous new sprays on the market at the present time demand an entirely new investigation of the subject.

The results are summarised as follows: Arsenite of zinc acts more quickly, and remains in suspension better than arsenate of lead, acid or non-acid; acid arsenate of lead was superior in these respects to the non-acid; the non-acid is slow, but finally kills; lime-sulphur did not prove of much value as a stomach poison, and when mixed with arsenicals seems to retard their action; lime-sulphur probably acts as a repellent to biting insects as Bordeaux mixture does against the potato flea-beetle; very young caterpillars placed on twigs which had been sprayed with lime-sulphur did not feed, and eventually died; half-grown larvae did feed to some extent, and when transferred to unsprayed twigs developed normally.

WINSLOW (R. M.). **The Economic side of Pest-Control.** *Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 17-21.

For the Province, expenditure on the control of pests for 1913 is estimated at 21,000 dollars for material, 20,000 for application, and 12,500 for 25 per cent. of equipment costs.

The paper also embodies a report on the cost of manufacturing lime-sulphur at Okanagan. With material at wholesale prices and freight at car-load rates, the commercial article delivered at Okanagan Points costs about £2 7s. per 40 gallon barrel of 625 lbs. Provided the same conditions obtain, the cost of manufacturing at Okanagan is about £1 0s. 10d. When buying material in less than car-load lots it would rise to £1 8s. 10d. approximately. There would be, in addition, the cost of a hydrometer (4s. 2d.), and the first cost of the boiling plant, which on a one-barrel scale need not be over £2 9s. 5d., and might be kept as low as 12s. 6d. or 16s. 8d. The product should test about 20° Beaumé, that is, not quite so strong as the commercial one which tests $32\frac{1}{2}$° Beaumé. Under proper conditions several dollars per barrel might be saved; but on the small scale, especially with inexperience, the saving would be more apparent than real.

TREHERNE (R. C.). **Methods of taking insect records in the field.** —*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 21-24.

Without claiming originality, the author puts forward several suggestions he has found useful. To determine percentage of infestation: select 5 typical locations in the field to be examined, and from them a typical row, tree, or plant to be inspected. Then count 50 plants, buds, fruit, or leaves, as desired, and examine carefully for

injury. Then the total number of injurious marks, divided by the total number of objects examined, multiplied by 100, gives the *percentage of infestation*. If it is wished to follow the observations by others during the same season, to observe the *progress of infestation*, stakes or markers should be used, so that the same area or ground is covered each time. Tables are given for estimating egg, larval, or adult abundance to an acre, and for making estimates on nursery stock rows, gooseberries, currants, raspberries, or such like bush-fruits, and for use with trees set on the square-planting plan, corn-hills and tomato plants. These methods may prove of practical use to the working field inspector.

RUHMAN (M. H.). **The Importance of Economic Entomology as a Subject of Education.** *Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 27-28.

It is stated that 50 per cent. of the insect pests of the United States are introduced species. The very rigid inspection of nursery stock, plants, and fruit enforced in Canada, makes it almost impossible for insect pests to be introduced through these channels, but the tradesman may leave the packing material of imported products lying about, and farmers and fruit-growers do likewise. Most of the latter have not the elementary knowledge and power of observation to make the best use of the advice now obtainable concerning the control of pests.

DAY (G. O.). **President's Address.** *Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 29-30.

Stress is laid on the importance of Systematic Entomology in this address, the speaker pleading for the amalgamation of the economic and systematic sides of the subject.

PALMER (L. L.). **Some problems in Aphis-control.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 31-34.

There is not a single operation in the proper care of orchards that may not influence the fruit produced, and no fruit-grower can afford to allow any insect pest which, directly or indirectly, injures the quality of the product, to go uncontrolled. If the cost of production is too high, the grower must reduce it, not by neglect of any single operation, but by making one operation aid another, by more thorough work in fewer operations. In dealing with orchards infested with woolly and green apple-aphis and scale insects, it is possible to work so thoroughly as to kill the one which is doing the most damage, or the two which are of greatest economic importance, and also very effectually check the third. For instance, a spray of 1 part concentrated lime-sulphur in 9 parts water, with the addition of 1 part Black Leaf 40 to every 800 parts of solution, applied with a power sprayer and a pressure of at least 175 lb., previous to the opening of the leaf-buds in early spring, should kill all over-winter woolly aphis above ground, as well as oyster-shell scale, when thoroughly brought in contact with

the insects: but it will not destroy all the green apple-aphis eggs. For green apple-aphis 1 part lime-sulphur concentrate in 30 parts water, with 1 part Black Leaf 40 to every 900 parts solution, should be applied after the leaf-buds have just opened, and will effectually kill the greater part. An application of a 15 per cent. solution of kerosene emulsion, or Black Leaf 40, 1 part to 900, about the 10th to 15th of September, in Vernon District, will free the tree-tops of woolly apple-aphis previous to the appearance of the winged viviparous females, which probably migrate to other host plants, beyond control.

Furthermore, the author recommends ploughing a furrow on each side of the trees in the spring or early autumn. A man follows up, and with a large digger hoe, or shovel, exposes as much of crown and roots as possible within a 4-foot radius of the tree; then sprays thoroughly with kerosene emulsion, forcing the spray well into the soil about the crown and base of the tree. As the ploughing is necessary every other year, advantage is thus taken of it to make the spraying more effective. Again, by arranging to prune the trees from 1 to 4 years old in late winter or early spring, the shining black eggs of the green apple-aphis are then easily seen, and can be clipped off in the regular pruning operation. By pruning in late winter the exposure of immature wood to the cold winter weather is also avoided.

LYNE (W. H.). **Two injurious insects of economic importance attacking peach, apricot, and plum trees.** *Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 34-36.

The method of control adopted for the peach twig-borer (*Anarsia lineatella*) consists of winter spraying with lime-sulphur 1-10, just as the buds are opening, and arsenate of lead 3 lb. to 50 galls. of water when the new growth starts. To protect the fruit from the second brood of larvae, use the arsenate spray just about the time the moths begin to fly by the middle of July in British Columbia. In dealing with the peach root-borer (*Sanninoidea exitiosa, opalescens*) it is best to cut the larvae out about the end of June before they pupate. Before replacing the earth round the tree the following wash should be applied: 1 part lime-sulphur to 6 parts water, with enough fresh-slaked lime to thicken 5 gallons of the mixture to a good thick paint; into this stir thoroughly ½ lb. whale-oil soap and ¼ pint carbolic acid or 1 lb. coal tar. When the paint has had time to dry on the trees, replace the earth, banking up 4 or 5 inches. This wash will also protect from fungous rot, etc., besides making it very difficult for the young larvae to penetrate. To save cutting, fumigation of the roots with carbon bisulphide has been resorted to, but is not popular, as there is danger of killing the tree. The peach root-borer is a most injurious pest, on account of its deadly work being done unseen in the most vital part. Its presence is often not suspected until the tree dies, after the crown of the roots has been successfully girdled.

MIDDLETON (M. S.). **Cutworms and their control.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 36-37.

It would seem that epidemics of insect pests are followed by periods of comparative rest, due almost wholly to parasitic control. The

latter is considered to have checked the epidemic of cutworms prevalent in 1912 in the Kootenay, for but little damage resulted in 1913. The pests injured nearly every cultivated plant, including green grain. Vegetable gardens and orchards suffered most, while they were very destructive in cabbage, turnips, and tomato fields, and damaged strawberry beds extensively. The most common varieties are the red-backed (*Paragrotis ochrogaster*), the greasy (*Agrotis ypsilon*), the variegated (*Peridroma saucia*, *Lycophotia margaritosa*), and the zebra caterpillars (*Mamestra canadensis*, *Polia nevadae*). The Canadian list might be extended to include the following:- yellow-headed (*Hadena arctica*, *Aplectoides speciosa*), spotted (*Noctua c-nigrum*), brown (*Nephelades minians*), W-marked (*Noctua clandestina*, *unicolor*), common striped (*Euxoa tessellata*), white climbing (*Carneades* [*Lycophotia*] *scandens*), spotted legged (*Porosagrotis vetusta*), and dingy (*Feltia subgothica*). Poison bait is possibly the best all-round material for control. Use 1 lb. Paris green, 50 lb. bran, about 3 lb. sugar. First moisten the bran a little, then add the Paris green and mix well, then add the sugar as sweetened water. The bait should be considerably sweeter than the plants the larvae are feeding on. About 25-50 lb. should suffice for an acre of vegetables and fruit. Fruit trees only will require much less. Keep the mixture well away from the trees or plants to prevent them from being injured. Tanglefoot has given good results in the case of fruit trees and larger plants, and banding with cotton batten is also useful. Running chickens are very effective in an orchard. Cultivation methods assist considerably. Cover crops left over winter as a protection harbour the larvae, the eggs of which might be destroyed if the sowing of the crop were delayed a little to allow of this.

TAYLOR (L. E.). **Economic Ornithology.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 37-41.

The author summarises his remarks by stating that there is a chance of imported birds becoming a pest and upsetting the balance of nature, and that scientific societies should protest against permission being granted for the introduction of any exotic birds into the country, either from aesthetic or economic considerations. At the close of the ensuing discussion it was moved and seconded, "That this Society, in view of recent researches into the economic value of introduced birds in other countries, disapproves of the practice of granting permits for the introduction of any exotic birds into this province." This was carried unanimously.

SWAINE (J. M.). **The economic importance of Canadian Ipidae** [*Scolytidae*.]—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.*, no. 3, N.S., 1913, pp. 41-43.

The genus *Dendroctonus* contains a number of species most injurious to conifers; *D. piceaperda*, Hopk., has killed an immense amount of the finest spruce timber in Maine and New Brunswick. *D. valens*, Lec., is commonly found in dying bark of spruce and pine logs, and not rarely is the primary cause of the death of the trees. In British

Columbia it is assisting *D. brevicomis* in killing bull-pine. An undescribed species of *Dendroctonus* breeds in the fire-injured timber of Manitoba, and has killed jack-pine, mostly near the burns. *D. simplex* breeds in dying larch-bark from Manitoba eastward, and apparently kills many trees weakened by the larch sawfly. Another undescribed *Dendroctonus*, assisted by species of the genus *Ips* (*Tomicus*), is apparently killing much white spruce along the Athabaska river. *D. pseudotsugae*, Hopk., everywhere kills injured and weakened trees, and frequently much green timber. *D. monticolae*, Hopk., has killed many western white pines (*Pinus monticola*) in the Sugar Lake region of British Columbia, and the outbreak is still spreading. It also kills the black pine there. *D. engelmanni*, *D. borealis*, *D. murrayanae*, and *D. obesus* are variably destructive to spruce and pine in the Province. Many species of genus *Ips* (*Tomicus*) are abundant in dying bark of pine, spruce, and larch. They are mostly secondary enemies, seldom attacking green timber. Some species, however, are injurious to pine and spruce in British Columbia and Alberta, and *Ips balsameus*, Lec., is a serious enemy to balsam fir throughout Ontario, Quebec, and New Brunswick, also injuring larch to a lesser degree. *Polygraphus rufipennis*, Kirby, and allied undescribed forms are everywhere important secondary enemies to pine, spruce, and larch. Several species of *Phloeosinus* are locally injurious to cedars. Certain twig-beetles of the genus *Pityophthorus* at times become sufficiently numerous to check and, rarely, kill the infested trees. Such injury was abundant on jack-pine in northern Ontario, and bull-pine in British Columbia. Belonging to this group are the peach-tree bark-beetle (*Phloeotribus liminaris*) and the fruit-tree bark-beetle (*Eccoptogaster rugulosus*) which are important pests in southern Ontario, and the former breeds also in the wild cherry in Quebec Province. The clover bark-beetle (*Hylastinus obscurus*, Marsh.) is injurious to red mammoth, alsike and crimson clovers in parts of Quebec and Ontario. The deciduous trees of Canadian forests suffer less from this family. Ambrosia-beetles, do not, as a rule, attack sound timber; in British Columbia their injury is only noticed in felled timber left out of water, or in fire-injured trees.

P. F. **Die Bekämpfung des Heu- und Sauerwurms mit Nikotin während des Jahres 1913.** [The use of nicotin against the vine moth in 1913.] *Luxemburger Weinzeitung, Grevenmacher*, i, no. 29, 1st Nov. 1913, pp. 499-506.

A Bordeaux mixture was used, and to it were added $1\frac{1}{2}$ parts soap jelly and $1\frac{1}{2}$ parts of Evert's tobacco extract (10%) per 100 parts spray. Eight reports were dealt with. Three stated there was no foreign taste in the must, two reported a bad taste, and the remaining three a very bad one. Too strong a percentage of nicotin (4%), and in one case the admixture of casein, are supposed to account for this. Several experimenters suggested that the copper was the cause and not the nicotin. Particular stress is laid on the fact that the successful use of poisons can only be expected when the vineyard is at the same time efficiently protected against *Oidium* and *Peronospora*. Nicotin is most advantageously employed when the flight of the moths is at its height.

Spraying must be carefully and thoroughly carried out, otherwise it is best not to incur a useless outlay. Nicotin will keep for years if packed in air-tight containers.

WILLIAMS (B. S.). *Hadena oleracea* **destructive to Tomatoes.**—*Entomologist, London*, xlvi, Dec. 1913, p. 333.

In a short note, attention is drawn to the fact that *Polia* (*Hadena*) *oleracea*, L., has done great injury to tomatoes all over England. The only remedy seems to be to collect the larvae by hand, and to take off the top layer of soil, when the insects are in the pupal stage, and burn it, both of which processes involve considerable labour. Being under glass, the insects are protected from birds, and apparently from parasites also. Fumigation had not been tried.

FRIEDRICHS (K.). **Ueber den gegenwärtigen Stand des Bekämfung des Nashornkäfers** (*Oryctes rhinoceros*, **L.**) **in Samoa.** [On the present state of the campaign against the Rhinoceros Beetle in Samoa.] *Der Tropenpflanzer, Berlin*, xvii, nos. 10, 11, 12, Oct.-Nov.-Dec. 1913, pp. 538-558, 603-619, 660-675, 19 figs., 2 sketch-maps.

The prosperity of Samoa is so largely dependent on the coconut palm that the control of the Rhinoceros Beetle constitutes a problem of the very highest importance. Where the Government has taken immediate and energetic measures, the pest has been reduced, but on the whole there has been an increase. The planting district around Apia has suffered most, as the beetle has undisturbed opportunities for breeding in the cacao and Hevea plantations, and the coconut palms being there comparatively few in number, serve as an attraction for countless beetles. The coast belt, being owned mostly by natives, who prosecute weekly searches, does not suffer so much.

The direction in which the pest spreads is generally determined by the prevailing wind. It was introduced with Hevea plants brought to Apia from Ceylon, and traces of its ravages were first noticed in 1910. On the east coast the damage is not very apparent, but the trade winds on the west coast have caused a rapid spread. The bush palm (*Cyphokentia samoensis*, Warb.) also provides the insects with food, but it is not feasible to combat the pest in the bush.

Protection of the Palms. Vosseler says that coarse-grained sand keeps off the beetle. This may be useful in the angles of the leaves, but does not protect the yet unopened leaves, which suffer most. Labour charges would also be heavy, as it is necessary to climb the palms in order to apply the sand. The tropical rains will also soon wash it away; experiments are being made with tar, as a protection for the young leaves, but it seems possible that it may prove injurious to the plants. Should a mixture of tar ($\frac{2}{3}$) and petroleum ($\frac{1}{3}$) reach the growing point through a bore-hole, it will kill the palm. Though this mixture was considered to be excellent by a local planter, the author saw numerous trees destroyed in this way on one plantation. It has not yet been ascertained if tar alone acts in this way.

Control by Collection. In the early morning, workers provided with a metal case and heavy knife search all rotten wood, heaps of leaves, etc., which may harbour the beetles. Every native must bring in a minimum number fixed by the village chief. About 9 o'clock the count is made and destruction effected by fire or boiling water. At the present time this collecting is the most efficacious measure. But the natives often render it illusory, either by gathering in special likely places instead of on their own plantations, or by robbing the trap heaps got together by the Government workers. Also they probably breed beetles for the purpose. But in spite of this, collecting remains a valuable aid.

Decoy Methods. Light has been used, but without much success. The author thinks it is only useful as an aid to other decoy methods. He has also experimented with toddy, but cannot report favourably on its usefulness as a means of attracting the beetles.

Trap heaps were employed as soon as the pest appeared, and much money was expended on them. Groups of 10 to 20 natives, under white supervision, erect heaps of old wood (especially pieces of palm trunk), leaves (especially of the banana), and earth. The lower part of the pile is in a trough, the upper part stands above the soil level. The total height is about 20 inches, generally less. Smaller heaps composed of leaves only have been used, but are being abandoned, as the natives turn them over. Cacao pods are buried in some plantations and make good traps. The heaps are turned over every six or eight weeks. This frequent search ensures the discovery of nearly every larva. Both females and males are found in these heaps; of 1,000 captured beetles 566 were females and 434 males, but the proportion varies considerably.

At present there are about 600 heaps, and in 1912, 11,300 beetles, 220 pupae, nearly 776,000 larvae and over 180,000 eggs were collected. In round figures, about a million pests were caught at a cost of 28,000 marks (£1,400), which works out at a little over 1 farthing each.

The author is of opinion that at present this method is as useful and as necessary as in the past. It has been shown that the application of carbon bisulphide to the heaps is effective, and the poison need only be used every 3 months; the cost would be less than that of digging up the heaps.

Besides carbon bisulphide a number of other substances were tried. Saltpetre gave really good results. It can be used with buried cacao pods; garden beds can be manured with it; trap heaps which are no longer required as such can be treated with it; it can be used on tree-trunks and roots.

Removal of breeding places. This is a most important measure. Dead palm-wood is always dangerous, and by boring a hole in the trunk and filling it with saltpetre, the latter will gradually permeate the wood. How long this action will be useful is still an open question. It is quite clear that by careful cleaning of the plantations the pest can be reduced.

Natural enemies. One of the reasons for the spread of the pest in these islands is the lack of natural enemies. The semi-wild pigs of the natives are not at all to be despised in this respect, and are already used for this purpose. Attempts have been made to introduce the

mole (*Talpa europaea*), but it is difficult to do so. Hedgehogs soon succumbed to the climate. Fowls and other birds are not of much use.

The author examines at length the question of parasites, and comes to the conclusion that parasitic wasps appear to be of greater importance than all the other enemies of this beetle. He mentions, amongst others, *Scolia carnifex*, Coq., and *Scolia oryctophaga*, Coq., as apparently specially suitable, if their introduction can be effected on a large scale.

But all animal enemies appear to yield in importance to a parasitic fungus (*Metarrhizium anisopliae*), which occurs in the islands, and evidently has other hosts besides the Rhinoceros Beetle. When the author first had a large number of larvae delivered to him, he noticed brown spots on some of them. Having isolated these, they died in about a week and became completely covered with this fungus. Healthy larvae were brought in contact with the bodies, and all succumbed. Practically all the larvae in the laboratory became infected, and died. The fungus thrives best in moderately damp cultures. A trap heap of leaves and rubbish infected with the fungus, has conserved its deadly powers for several months, up to the time of writing, and has been fatal to every brood in it. The fungus does not prevent the beetles from laying their eggs there, which is a most important point. The fungus also spreads in the neighbourhood of the heap. Experiments have proved that the flying beetles can carry it to other breeding grounds. As the thoroughly infected heaps would only require a simple examination once every 3 months (later on once every 6 months), the number of heaps could be increased tenfold. The best method is to use cacao pods buried under a layer of earth. Quite fresh pods should not be used. The fungus is already in satisfactory use on the plantations, and planters have begun to assist its spread. A lengthy bibliography of pests of the coconut concludes the paper.

VON GRAUMNITZ (C.). **Die Blattschneider-Ameisen Südamerikas.** [Leaf-cutting Ants of S. America.]—*Internat. Entom. Zeits., Guben*, vii, no. 35, 29th Nov. 1913, p. 233, & no. 36, 6th Dec. 1913, pp. 240-242.

The leaf-cutting ants, *Atta discigera*, *A. coronata* and *A. hystrix*, are very prevalent in parts of Brazil. The present paper gives a description of their leaf-cutting habits and the structure of their nests. The trees which they most persistently attack are the orange and peach, and in the vegetable garden, the cabbage and allied plants; they attack also ripe bananas, maize, rice, etc. They do not use the leaves directly as food, but allow them to rot and thus produce a favourable medium for the growth of the fungus, *Rozites gongylophora*, which is their staple article of diet. The nests are underground, and are built on a very complicated and ingenious plan; the eggs are laid in the decaying leaves, which form a large porous mass in the nest, rather like a sponge. In this mass are found eggs, larvae, and pupae in all stages of development; the fungus growing on the leaves serves as food material for the larvae as well as for the adult ants. The ants cultivate this particular fungus very carefully, destroying any other kinds of fungi which make their appearance. It is quite common to find snakes' eggs amongst the leaves; the warmth given out by the

decomposing mass makes it a suitable place for this purpose; among others, the eggs of *Elaps corallinus* have been identified.

RUGGLES (A. G.). **Notes on a Chestnut-tree Parasite.**—*Science*, *Philadelphia*, xxxviii, no. 989, 12th Dec. 1913, p. 852.

While working in connection with the Pennsylvania Chestnut Tree Blight Commission last winter, the author noticed numerous burrows which were almost always present in the bark of the chestnuts, particularly in the smooth-barked trees. He was satisfied that the burrows were not the work of *Agrilus bilineatus*, as had been suggested by Metcalf and Collins in the U.S. Farmers' Bulletin, No. 467. They eventually proved to be due to the larvae of a small moth, which hibernate in the burrows in either the second or third instar. When finished, the burrow is not very extensive, the longest being not more than six inches, and extending longitudinally. While the insect is within the trees the burrow cannot be detected externally. After the emergence of the larva, however, the bark swells over the burrow, often cracking and making a conspicuous wound. The larvae leave the trees during the first part of June through minute exit holes, dropping to the soil, in which they spin a seed-pod-like cocoon, characteristic of some of the Microlepidoptera. The single perfect insect obtained was in too injured a condition to be identified. The number of exit holes made by these insects is enormous in any given area of chestnut forest, and as these holes are made just at the time when the blight spores are very abundant, and conditions generally are favourable for their development, it is believed that this insect has an important bearing upon the spread of the chestnut blight, *Endothia parasitica*.

DOANE (R. W.). **The Rhinoceros Beetle** (*Oryctes Rhinoceros*, **L.**) **in Samoa.**—*Jl. Econ. Entom., Concord*, vi, no. 6, Dec. 1913, pp. 437-442, 2 pl.

The Rhinoceros Beetle, *Oryctes rhinoceros*, L., has long been known as a more or less serious pest of coconut trees in many tropical countries. It is gradually extending its range, and wherever it gains a foothold in a new country its ravages usually cause great financial loss. The island of Upolo, German Samoa, is one of the recent places to suffer from the introduction of this pest. In districts where the infestation is worst, hundreds of trees are being killed on many of the plantations, and many others badly injured. As the beetles attack the most vital part, the succulent crown, one or two will quickly kill a young tree. Older trees are better able to withstand attack, but even a few beetles in them will soon make them unproductive. The beetles usually attack the tree between the base of a leaf and the trunk, or between the bases of two leaves. Having reached the tender heart of the tree, the beetles feed on it, probably for some weeks, often destroying much or all of it, thus killing the tree.

The life-history of the insect has not been thoroughly worked out, but in Samoa it probably takes a year to complete its development. The eggs, which are laid in batches of 10–30, hatch in a very short time, and the larvae feed for several weeks, possibly for some months.

The pupae are rarely seen, and never in considerable numbers; many of the larvae probably pupate at some distance below the surface of the ground. The pupal stage lasts for about 10 days to a fortnight.

In Samoa many control methods have been tried. In the author's opinion, tar is the most valuable repellent, but its use gives only a small measure of protection. Trees treated with lysol, or lysol mixed with tar, continued to be badly injured. Sand was poured into the crowns of a few trees, and on others a mixture of sand and arsenic, care being taken that plenty lodged at the bases of all the leaves. The arsenic injured the leaves; otherwise the trees were not badly attacked, but there was not sufficient time to test this method thoroughly. Dusting with white arsenic, Paris green, etc., is not satisfactory, owing to the fact that the beetles do not swallow the leaves or fibre. Pouring carbon bisulphide into the holes made by the beetles, killed the beetles, but also injured the tree. Bait traps, if carefully prepared, are quite effective on well-cleaned plantations, but they are expensive and require close supervision. For the present, the most effective method is to destroy the breeding places of the beetle by removing all decaying logs, etc., from the plantation. [See above, pp. 26-28.]

WOLCOTT (G. N.). **Report on a Trip to Demerara, Trinidad and Barbados during the Winter of 1913.**—*Jl. Econ. Entom., Concord,* vi. no. 6, Dec. 1913, pp. 443-457.

In Demerara the small moth-borer (*Diatraea saccharalis*, F.), and the closely allied species, *D. lineolata*, Walk., and *D. canella*, Hmp., are the most serious pests of cane. On nearly every estate there are gangs of boys, sometimes as many as 50 in a gang, who do nothing else the year round but cut out the dead hearts killed by the *Diatraea* larvae. It shows how serious the pest is that the boys have no difficulty in collecting 700 larvae day after day. The problem of controlling *Diatraea* is most seriously complicated by the dry and wet seasons. There are always two, and sometimes four, wet seasons and as many dry. Cane is cut towards the end of each dry season, and seed cane is planted at each wet season. A crop takes 18 months to mature, so that cane in all stages of growth is present on a single estate at all times. Moths will fly out a hundred yards or more from the older cane and deposit eggs on the young cane from which all the dead hearts have just been cut out, and in a few weeks the infestation will be as heavy as if no control had been attempted. In Demerara there are four insect parasites of *Diatraea*, but in spite of these, and of the artificial control, *Diatraea* still remains a serious pest. The one measure that can be adopted is the simultaneous planting of enormous blocks of cane; it is the indiscriminate scattering of the fields of all ages of cane on an estate that makes possible the rapid and easy infestation of young cane.

The only other serious cane pest in Demerara is the giant moth-borer (*Castnia licus*, F.). The larva enters the cane near the ground and burrows down into the root and up into the stalk. There are fortunately several practical methods of control. They are as follows: (1) Collecting the adult moths in butterfly nets; (2) cutting out the young larvae in the young ratoon cane; (3) cutting out the older

larvae and pupae from the stools of cane after the crop has been harvested; (4) in the case of very heavy infestation, the flooding of the entire field after the cane is cut.

Much cane is also injured by termites: they never attack sound cane, but as all the cane in Demerara is infested with *Diatraea*, the termites have no difficulty in finding a place of entrance into the interior of the stalk. The method of control adopted consists of carrying the nests away and burning them. The sugar-cane mealy bug (*Pseudococcus calceolariae*, Mask.), was moderately abundant, but it is not considered a serious pest; it is kept in check by a predaceous beetle, the name of which has not been determined.* [See this *Review*, Ser. A, i, p. 521.]

In Trinidad the most injurious pest is not *Diatraea*, as it is in practically all other sugar-producing countries of the West Indies, but a froghopper (*Tomaspis varia*, F. [*saccharina*, Dist.]). It passes through its larval stages underground, feeding upon the roots of cane, grass and weeds; the adult sucks juice from the leaves and stalk of the cane, but produces no serious injury.† Despite the small size of the nymphs, the enormous numbers in which they appear on the roots of the cane, either kill the cane outright, or so stunt the growth that the crop is worthless. The control of this pest is rendered the more difficult because of the lack of vulnerable places in its life-history. As all ordinary methods of control are impracticable a novel plan of campaign has been adopted. This depends on the circumstance that the fungus *Metarrhizium anisopliae*, Sorokin, produces a fatal disease among froghoppers called Green Muscardine. Planters cultivate this fungus, and at certain seasons dust its spores over the entire fields; although this method is of too recent origin to have borne the test of time, it is already stated that in one examination made by Mr. Urich, where spores had been applied early, at least 95 per cent. of the nymphs in the stool of the cane were found dead and covered with the characteristic spore-masses of *Metarrhizium*. *Castolus plagiaticollis*, an efficient predator on the adult froghopper, has been imported from Mexico. Two Chalcidid parasites have been bred by Mr. Guppy, Mr. Urich's assistant. *Castnia licus* does great injury to canes in Trinidad. The only practicable method of control is the catching of the adults with butterfly nets; this has produced good results. Among the more important minor pests are the weevil stalk-borer (*Metamasius hemipterus*, var. *decoloratus*, Gyl.), the "gru-gru" worm (*Rhyncophorus palmarum*, L.) and the sugar-cane mealy bug (*Pseudococcus calceolariae*, Mask.)

In Barbados the froghopper and the larger moth-borer are absent, but otherwise the insect pests are similar. *Diatraea* does an enormous amount of injury; both kinds of the sugar-cane mealy bugs (*Pseudococcus calceolariae*, Mask., and *P. sacchari*, Ckll.) are abundant. *Delphax saccharivora*, Westw., the sugar-cane leafhopper, and *Metamasius hemipterus*, L., the weevil stalk-borer, also do considerable damage. With the exception of *Diatraea*, however, all these are minor pests in

*[Specimens of this Coccinellid, sent by Mr. G. E. Bodkin, from Demerara, and by Mr. J. R. Bovell, from Barbados, have now been identified as *Hyperaspis trilineata*, Muls.—Ed.]

†[This view is disputed by Mr. J. C. Kershaw, who has just devoted a year to the special study of this insect.—Ed.]

comparison with the injury produced by the weevil root-borer (*Diaprepes abbreviatus*, L.) No effective method of control is known, but the numbers of the grubs can be considerably reduced by hand-picking of the adults, which collect in large numbers on corn and sorghum. The insect eats most of the small roots and chews the centre out of the main tap-root. As regards *Diatraea*, *Trichogramma minutum* is its only parasite in Barbados. Another interesting pest, from the point of view of those interested in parasitism, is *Phytalus smithi*, which is parasitised by a black Scoliid wasp, *Tiphia parallela*, Smith. *P. smithi* occurs also in Mauritius; it was probably introduced there in cane sent from Barbados. Until now the controlling parasite, *T. parallela*, was not present in Mauritius, but efforts are being made to import it.

WILSON (H. F.). **Notes on *Podabrus pruinosus*.**—*Jl. Econ. Entom., Concord*, vi, no. 6, Dec. 1913, pp. 443-457, 1 fig.

This insect is one of the most important agents in the control of all forms of plant lice. It has been very abundant in the Willamette Valley, Oregon, during the past two years. The rosy apple aphis (*Aphis sorbi*, Kalt. ?), the black cherry aphis (*Myzus cerasi*, F.), and the vetch aphis (*Macrosiphum pisi*, Kalt. ?) are held in check by this insect. The adults appear early in May, and are abundant by June. By July only a few individuals are found. They are commonly found in vetch fields, and in the rolls of infested apple and cherry leaves. They undoubtedly destroy many aphids in a day, and are of great economic value.

The eggs were not observed in the field, but in the insectary they were deposited on the ground in masses. The larvae are found in the ground from 3-6 inches below the surface; they are pink in colour and covered with fine hairs. The pupae are found in earthen cells in the moist earth; at first they are white, then they change to pink, and then to dark blue. The adults are dark blue with light brown markings.

HINDS (W. E.). **Powdered Arsenate of Lead as an Insecticide.**—*Jl. Econ. Entom., Concord*, vi, no. 6, Dec. 1913, pp. 477-479.

The use of powdered arsenate of lead is said to have given very satisfactory results as an insecticide; the statement is the result of experience, and direct experiment made in the Agricultural Experiment Station at Auburn, Alabama. It has the advantage over the paste preparation in that it weighs much less, and, therefore, the cost of transport is less; it is not liable to harden and cake, as the paste is; and it is not so difficult to work up into a uniform suspension in water for spraying. Over Paris green it possesses the great advantage of not causing skin injury to the men using it. The Department of Entomology of the Alabama Experiment Station is now making an investigation covering the use of various forms of arsenate of lead, with a view to finding exactly what form is most effective, economical and generally satisfactory for use against various insect pests. For the present there is no reason why anyone should hesitate to use powdered arsenate of lead in preference to Paris green or any other arsenical poison.

Felt (E. P.). *Arthrocnodax carolina*, n. sp.—*Jl. Econ. Entom., Concord*, vi, no. 6, Dec. 1913, pp. 488-489.

Mr. E. A. MacGregor, who reared this species both in 1912 and 1913 from red spiders on cotton, is of opinion that it is the most important natural agent in controlling this pest. The new species is allied to *A. apiphila*, Felt, and is distinct from *A. occidentalis*, Felt, which is recorded as preying upon red spiders in California.

Amendment to "The Destructive Insect and Pest Act of Canada."

In line 14 of Regulation 3, the words " Importations by mail shall be subject to the same Regulations," have been deleted, and a new Regulation, No. 18, has been added, reading :—

" 18.—The importation of all nursery stock, including trees, shrubs, plants, vines, grafts, scions, cuttings or buds, through the mails, is prohibited, excepting greenhouse-grown florists' stock, cut flowers, herbaceous perennials and bedding plants, which will be admitted provided that a detailed statement of the contents is attached to such parcels."

This Regulation takes effect on and after the first day of March, 1914.

Sudeikin (G. S.). **Вредители сельско-хозяйственныхъ растенiй Воронежской губернiи, по наблюденiямъ 1912.** [Pests of agricultural plants in the Government of Voronezh, according to observations made in the year 1912.]—*Published by the Zemstvo, Voronezh*, 1913, 68 pp.

This is a report of the Government Entomological Station of Voronezh, which was only inaugurated in May 1912.

Insects injurious to crops.—*Caloptenus italicus*, L., appears periodically, and is very widespread, but last year there were fewer complaints of its activity. *Anthothrips aculeatus*, F., and *Limothrips denticornis*, Hal., were found in some districts ; the remedy suggested is to keep the fields clean from weeds, and to plough-in the stubble in which the insects winter. For *Aelia acuminata*, L., the following remedies are recommended : hand-picking, catching the young (wingless) specimens in trenches (containing bait-holes) ; surrounding the fields and spraying with soap water or naphtha emulsion at dusk or during moonlight nights.

Aphis gossypii, Glov., is specially injurious to Cucurbitaceous plants. Remedies : (1) repeated spraying with soapy water (1 lb. green soap, ½ lb. ordinary soap, and 2·7 gals. water) every 10 days from the moment of the appearance of the insects till the time of oviposition ; (2) destroying by burning all attacked plants ; (3) frequent re-ploughing of the infected areas during autumn and spring ; (4) rotation of crops ; (5) the removal and burning of all stalks and leaves after the harvest. The boring of grain by the larvae of *Sitotroga cerealella*, Ol., and *Tinea granella*, L., in stores, as well as in the fields, is very frequent. Remedies : (1) the immediate disinfection of the storehouses by carbon bisulphide ; (2) the sorting of the seeds by winnowing in autumn and spring before

sowing, as well as after thrashing, and burning or giving to cattle the winnowed seeds; (3) careful and deep planting of the seeds when sowing maize; (4) the destruction of the lumpy stratum formed by the caterpillars on the top of heaps of grain.

Phlyctaenodes sticticalis, L., appears yearly, doing more or less damage. Last year the caterpillars in some parts totally devoured the sunflowers, maize, pumpkins, melons and cucumbers. The caterpillars of *Homoeosoma nebulella*, Hb., do considerable damage to sunflower seeds. *Plusia gamma*, L., injures many cultivated plants, principally beets and linseed, but last year there were practically no complaints of its activity.

Lema melanopa, L., has done considerable damage to oats, barley, and summer-sown wheat, during the latter half of June and the beginning of July. As remedies are recommended: (1) shaking the insects off the oats with brooms in the mornings, after which the attacked spots must be dusted with ashes or lime through a sieve; (2) the spraying of three per cent. solution in water of barium chloride or Paris green (1 oz. green and 3 oz. freshly slaked lime in 6 gals. water); (3) summer sowing instead of winter sowing, or the earlier sowing of summer crops. *Psylliodes attenuatus*, Koch, *Chaetocnema concinna*, Chevr., and *P. breviuscula*, Fald., have damaged hemp seeds and beets. As a remedy "a tanglefoot cart" is suggested, consisting of a board on wheels, smeared on the lower side with molasses or pitch, to be wheeled over the plants during the hot hours of the day, so as to catch the insects when they jump.

Calandra granaria, L. In an appendix to the report the campaign against this pest in the municipal grain stores of Voronezh is described. Carbon bisulphide has been used successfully, and it has been noticed that this remedy gives better results in warm weather than during cold or windy weather. The germinating capacity of the grain is not affected if the proportions do not exceed about 1 lb. of bisulphide for each ton of grain. *Lethrus apterus*, Laxm., damages various young plants, and particularly sown sunflower seeds. The following remedies are given: (1) trenches round the plantation; (2) spraying with Paris green; (3) ploughing the infected plots in autumn or early spring, and keeping them clear from weeds to the end of May; (4) hand-picking.

Anisoplia austriaca, Hbst., is very widespread in the Government. The usual remedy consists in hand-picking, the insects being driven by a rope to one end of the field, where they are at once picked up by men with sacks. The Zemstvo pays a premium for the collection of this insect, and the author suggests that this ought to be encouraged and properly organised. The insect usually begins by damaging the ears of winter-grown crops, passing afterwards to barley and summer-sown wheat. The beetles oviposit in July on the borders of the fields, so that the ploughing of these parts in August would lead to the destruction of the eggs and of the young larvae.

Mayetiola (*Cecidomyia*) *destructor*, Say, is a serious pest of grain, and is found everywhere in the Government. The remedies usually applied are ploughing, burning of the stubbles and trap-crops.

The larvae of *Bibio hortulanus*, L., damaged sugar-beets in one locality; as remedies are suggested: the complete removal of the

remains of the harvest from the plantations; harrowing the infested plots in autumn or early spring, after spreading quicklime; and spraying in early spring with a 4 per cent. solution of Chile saltpetre. *Hylemyia coarctata*, Fall., has done considerable damage to winter rye in one locality. *Oscinis frit*, L., is widespread, and often mistaken for *M. destructor*; it has damaged barley and black barley in some places. To fight the insect the author recommends: (1) to sow summer crops as early as possible, and use seeds which tiller less; (2) to place the seeds at a uniform depth, so that the sprouts should appear simultaneously; (3) not to allow the summer crops to get over-ripe; (4) to replough the stubbles immediately the harvest is over; and (5) not to sow summer crops near the damaged winter ones.

Orchard Pests.—*Tingis piri*, Geoffr., is found everywhere, and damages apple, pear and cherry trees, from July to September. Repeated sprayings with soap water (¼ lb. ordinary soap in 2·7 galls. water) kills the insects. The autumn cleaning of the orchards from the fallen leaves and the burning of all waste is also recommended.

Pysllu mali, Först., has been proved to exist in several districts, and in the opinion of the author, probably occurs in all the others, although growers do not notice its presence, and attribute the injury done by it to frost. Repeated and abundant spraying of the trees in late autumn and early spring with 3·5 per cent. solution of green copperas when the larvae appear; spraying with tobacco or quassia extract; and burning the small branches cut away in autumn and spring, are the remedies suggested.

Psylla pyricola, Först., *Aphis pomi*, de G., *Myzus cerasi*, F., *Hyalopterus pruni*, F., and *Rhopalosiphum ribis*, Buckton, are found everywhere, and were successfully controlled by spraying with soapy water. *Lepidosaphes ulmi*, L., *Mytilaspis pomorum*, Bouché, and another unidentified Coccid were very widespread on apple trees. Amongst the suggested remedies are: spraying and smearing of the leafless trees in autumn and spring with limewash, containing 2–3 wine-glasses of crude carbolic acid or 1 lb. of green copperas to 2·7 galls. of the solution; the intensive manuring of the attacked trees; the pruning of the crowns; spraying with carbol or naphtha emulsions in May, June, etc.

The author considers that *Hyponomeuta malinellus*, Z., takes the first place amongst the pests of orchards in the Government. Its caterpillars are most active throughout June. The best remedy is spraying with tobacco decoction (a handful of tobacco to each 2 gals. of water), which must be done when the caterpillars are still young and have not yet prepared their webs. It is also useful to spray the leafless trees abundantly and repeatedly in autumn and in spring, before the swelling of the buds, with a 5 per cent. solution of sulphate of iron; to burn the thin branches cut away from the trees; and especially to spray the crown with milk of lime to which sulphate of iron is added (1 lb. of sulphate to each 2·7 galls. of the solution). *Hyponomeuta variabilis*, Z., flew in great numbers near the town of Voronezh at the beginning of August, the larvae mining the leaves of cherries.

There was only one generation of *Cydia* (*Carpocapsa*) *pomonella* in

1912; although in June and July the caterpillars occurred everywhere in fruits, no pupae or moths of the second generation were found.

Cydia funebrana, Tr., also damaged plums; the liming of the stems, the shaking down and collection of the wormy plums, and the digging up of all brushwood near the trees in autumn and in spring, are the remedies recommended. The caterpillars of *Bembecia hylaeiformis*, Lasp., injured the stems of raspberry bushes; the most effective remedy is to dig out the injured stems with the roots in autumn and to burn them. There were complaints from various districts of damage to fruit trees by *Cossus cossus*, L., and *Zeuzera pyrina*, L.

The larvae of the following Lepidoptera are recorded as causing serious defoliation of fruit trees:—*Aporia crataegi*, L., *Malacosoma neustria*, L., *Lymantria dispar*, L., and *Euproctis chrysorrhoea*, L., for which the usual remedies are recommended. Among the injurious sawflies noted are:—*Pteronus ribesii*, Scop., on gooseberry bushes; *Selandria adumbrata*, Klug, on the leaves of cherry, pear and apple trees; and *S. fulvicornis*, Klug, on plums.

Sacharov (N.). **«Нозявка»** (*Galerucella tenella*, L.) **какъ вредитель клубники и другіе виды изъ группы** Galerucini, **встрѣчающіеся въ Астраханской губ.** [*Galerucella tenella*, L., as a pest of garden-strawberries, and other species of *Galerucini* found in the Govt. of Astrachan.]—*Published by the Entom. Sta. of the Astrachan Society of Fruit-Growers, Market-Gardeners and Agriculturists, Astrachan*, 1913, 6 pp.

There are several species of *Galerucella* found in the Government of Astrachan, such as *Xanthomelaena*, Schr., which injures elm trees; *G. viburni*, Payk., attacking *Viburnum opulus*, and *G. lineola*, F., a pest of willows. *Galerucella tenella*, L., found by the author on strawberries, has not been previously recorded as injurious to these plants. The beetle winters underneath old leaves on the beds of strawberries; with the arrival of warm weather the insects appear and feed on the young leaves, and oviposit during April and May; the eggs are deposited by the female in a hole gnawed by it in the leaf, 3–10 eggs being laid in such a hole; the egg stage lasts 12–14 days. The author describes the egg, larva, pupa and imago, as well as the damage done.

The remedies suggested are: the destruction of weeds on the beds and keeping the soil friable continuously during the whole summer; but the most effective remedy is spraying with Paris green ($\frac{1}{2}$ lb. of green and 1 lb. of lime dissolved in about 32–33 gals. of water); the spraying must be done first in April, as soon as the young leaves appear, then again in May, when the ovaries are formed, and again, if necessary, after the removal of the berries. As the insects keep mostly on the lower side of the leaves, special attention must be paid to spraying from below.

Russian Crop Pests.—**Извѣстія Главнаго Управленія Землеустройства и Земледѣлія.** [*Weekly Gazette of the Central Board of Land Administration and Agriculture*,] *St. Petersburg*, no. 47, 7th Dec. 1913, p. 1210.

The past autumn was not favourable to the activity of various pests,

and they have not, therefore, caused much damage to sprouted winter-sown crops. *Euxoa segetum* was chief amongst the pests noticed, and it has been reported from nearly all the Governments outside the "chornoisiom" area, and also from the following "chornoisiom" Governments:—Orel, Riazan, Tambov, Voronezh, Kiev, Taurida, Ekaterinoslav, and the Province of Don. Winter-sown crops, especially the early ones, were, however, seriously injured by this pest in Kazan, Viatka, Olonetz, and the western parts of Perm, and in some localities it has even been found necessary to re-sow. Elaterid larvae have done some small damage in Kiev, Cherson, Charkov, Tchernigov, Poltava and Vitebsk. *Mayetiola* (*Cecidomyia*) *destructor* has been reported from Kursk, Orel, Tambov, Podolia, Kiev, Bessarabia, Cherson, Taurida, Ekaterinoslav and Poltava; while the presence of *Oscinis frit* has been noticed in Kursk and Charkov. In Tula and in the Vistula Governments the crops were damaged by larvae of *Melolontha*.

As to Asiatic Russia, *Euxoa segetum* and Elaterid larvae were reported from various parts of Tobolsk, Tomsk and Enisseisk, and in the steppe provinces of Akmolinsk, Semipalatinsk and Turgai, although the damage done by them was very small and limited to a few localities only. In Tobolsk, *Haltica* and *Phyllotreta* were found, while from Enisseisk and the province of Akmolinsk *M. destructor* was reported. Egg-clusters of locusts were deposited in large numbers in Tobolsk and Akmolinsk. All these pests have done, however, very little damage, and disappeared with the early rains.

SIJAZOV (M.). **Наиболѣе дешевый и сильнодѣйствующій инсектисидъ для уничтоженія саранчевыхъ насѣкомыхъ.** [The cheapest and most effective insecticide for the destruction of locust pests.] — **«Туркестанское Сельское Хозяйство»** ["*Agriculture of Turkestan*,"] *Tashkent*, no. 1, Jan. 1913, pp. 30-35.

The author points out the advantages of sodium arsenite as compared with the insecticide usually applied in Turkestan, viz., Paris green with lime. The former dissolves easily in water, giving a solution which does not choke the sprayer; it withstands the influence of even heavy rains, when mixed simply with milk of lime and not with molasses or treacle, sticking firmly to the plants, and not requiring repeated sprayings; and under equal conditions and in equal doses it proves twice as rapid in its effects as Paris green. He also states that whereas Paris green contains only 24·3 per cent. of metallic arsenic (not arsenic acid), sodium arsenite contains 45·2 per cent. The author further deals with the prices of this chemical and the duties on it in Russia, and gives a comparative table showing the amount and cost of both insecticides necessary for one dessiatin (2·7 acres) in Turkestan. From this it appears that when using sodium arsenite it is possible to obtain a saving of from 30 to 60 kopecks (7½d. to 1/3) per dessiatin; taking into consideration that in Turkestan the campaign against locusts is distributed over large areas—50,000–60,000 dessiatins (162,000 acres)—this would result in a saving of about 10,000 rubles (£2,000).

The author points out that sodium arsenite, like Paris green, may

burn the plants, and requires careful handling by the workmen engaged in the operations.

PONIATOVSKY (S.). **Къ вопросу о борьбѣ съ Марокской Кобылкой, въ Бухарѣ.** [On the question of the fight against *Stauronotus maroccanus*, Thb., in Bokhara.]—*Agriculture of Turkestan, Tashkent*, no. 2, Feb. 1913, pp. 109-114, 1 map.

The author first reports on the results of fighting locusts in the five districts of south-eastern Bokhara in 1912, where the campaign has covered nearly 200 square miles, and has cost about £22,000. He mentions that the method of applying movable iron screens has proved very cheap, and resulted in considerable saving; only some 270 acres of crops have been destroyed by the pests (non-flying insects), and enormous masses of the latter have been destroyed. In the eastern part of the Khanate no large swarms of locusts have been noticed since the campaigns of 1910-1911, but they are beginning to appear again, and it is estimated that next spring it will be necessary to start operations against them over an area of about 10 square miles. The favourable results were considerably diminished by the appearance of migrating locusts from the neighbouring steppes of Afghanistan, and apart from the damage done to crops by these flying swarms, they have deposited eggs over an area of 33 square miles, and about £32,000 are asked for the campaign during the next season. The author further draws serious attention to the fact of the immigration into Bokhara of locusts from Afghanistan, into which country according to statements by natives, they migrate from India, so that international endeavours are necessary to check the injurious activities of these pests. The author points out how the fight against locusts in the province of Samarkand proved fruitless so long as no remedies were applied against them in Bokhara, and how the fighting of the insects in that country led to a diminution and even total disappearance of them in some localities of Russian Turkestan. This does not apply to two other species of locusts found in Turkestan, namely *Caloptenus italicus*, L., which has a local breeding place, and *Locusta migratoria*, L., which breeds in the delta of the Syr-Daria, as well as at that of the Amu-Daria, but rarely flies far from its breeding places. The author further urges upon the Government of Bokhara the absolute necessity of fighting the insects, the expenses not exceeding 0·1 per cent. of the budget of the Khanate, which itself depends on the harvest and on the land duties collected in kind; he also points out the importance of the cotton cultivation of Bokhara and Turkestan to the Russian textile industry. A map is appended showing the distribution of locusts in Central Asia.

SIJAZOV (M.). **Къ Біологіи Марокской Кобылки.** [On the biology of *Stauronotus maroccanus*, Thb.]—*Agriculture of Turkestan, Tashkent*, no. 2, Feb. 1913, pp. 115-126, 9 figs., 2 pl.

In the first part of his paper the author deals with the early stages of *Stauronotus maroccanus*, of which he gives a detailed description. There are five moults, and the period occupied by these stages is 35–

42 days. The second part is devoted to a consideration of the movements of the swarms of larvae. After extensive investigations in the field, the author concludes that these movements are not influenced by such factors as wind, sun, etc.; nor do they take place in any definite directions, being merely the fortuitous result of the gregarious instinct combined with the search for food. Cultivated crops appear to exercise no special attraction for these insects, and if the wild plants on the steppes afford sufficient food, the locusts will remain there during their whole period of development. On the other hand, the migratory movements of the flying locusts are more definite, the swarms always entering Russian Turkestan from the south, originating in Afghanistan.

SMIRNOV (D.). **Польза, приносимая Трясогусками въ Туркестанѣ.** [The utility of the Wagtail (*Motacilla*) in Turkestan.]—*Agriculture of Turkestan, Tashkent*, no. 3, March 1913, pp. 149-251.

The author draws the attention of farmers to the value of these birds in destroying the common pest of lucerne in Turkestan, *Hypera variabilis*, Hbst. These weevils start ovipositing in the Merv oasis on young leaves of lucerne as early as February; in 1912 the author found larvae on the 1st March. Oviposition proceeds till April, and the larvae do considerable damage, estimated at 50 rubles (about £5 5s.) per dessiatin (2·7 acres); the damage is the more felt as at this time there are no supplies of lucerne from the previous year, and food for cattle is very dear. The larvae appear in greatest numbers in March, there being only one generation in the year. In March the wagtails appeared, and the author observed both *Motacilla alba*, L., and *M. feldegii*, Mich.; the former species is not a resident, and soon disappeared. The author has found in the stomach of 5 birds, which were able to feed only half a day, 152 larvae of *Hypera* and 2 beetles; he estimates that the whole flock of birds on the spot under observation numbered a hundred, and that these would have destroyed as many as 6,000 larvae in one day. The importance of these birds is the greater, as the pest has no other natural enemies in Turkestan; the author obtained only two specimens of the parasite *Canidia curculionis* out of a thousand larvae. He considers that all the birds of this genus are useful to farmers, as their life-habits are very similar.

PORTCHINSKY (I. A.). **Насѣкомыя, вредящія хлѣбному зерну въ амбарахъ и складахъ.** [Insects injurious to grain in stores and warehouses.]—**Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. З. и З.** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture,*] *St. Petersburg*, x, no. 5, 1913, pp. 84, 5 tables, 3 figs.

The author prefaces his book by some introductory general remarks as to insects injurious to grain in Russia, where these pests have sometimes destroyed more than half of the stored harvest in some localities, which, especially in the eighties of last century, seriously injured the export of Russian grain; he describes, generally, the nature of the

damage and its influence on the quality of grain and on human beings consuming bread prepared from such flour. He also deals with some of the generally applied remedies, mentioning first salt, the use of which was recommended even in the eighteenth century. Another old remedy is birch-tar, and the author has satisfied himself by experiments conducted some 8 years ago, that this substance does not in any way interfere with the quality of bread obtained from grain subjected to its influence, no smell or flavour remaining. Some experiments by A. I. Dobrodeev have shown that *Calandra granaria* although remaining alive for some considerable time when exposed to the emanations from tar, are unable to feed or copulate, and mostly remain lying motionless on their backs; *Anobium paniceum* is better able to withstand its influence.

A still better remedy than tar is naphthalene, the use of which has also been recommended by the author since 1905, and this is now considered in Australia to be the principal preventive remedy. When used in small doses (small bags containing about ½ lb. of naphthalene each, put on the surface of the flour) and especially when applied to grain, it keeps away the insects and leaves no disagreeable taste in the bread prepared from such grain or flour. The author describes some experiments conducted on *Sitotroga cerealella*, *Anobium paniceum* and *Calandra granaria* with naphthalene, which show that all these insects ultimately perish after being subjected to its emanations for a more or less considerable period, remaining most of the time in a state of collapse. The methods of applying carbon bisulphide and hydrocyanic acid are also fully described.

A description is given of the following beetles and their various stages, together with an account of their habits and the damage done by them: *Calandra granaria*, L., *C. oryzae*, L., *Anobium paniceum*, L., *Ptinus fur*, L., *Tenebrio molitor*, L., *Tribolium confusum*, Duv., *Gnathocerus cornutus*, F., and *Silvanus surinamensis*, L. In addition to the usual remedial measures, mention is made of the use of sheep skins, which are spread in the evening on the stored grain; the insects settle on them and become entangled in the wool, so that they can be destroyed in the morning.

Besides the above insects, there were frequently sent to the Bureau samples of damaged flour containing other species which evidently did not cause serious injury to the flour, such as *Enicmus minutus*, L., *Lathridius bergrothi*, Reit., etc. There were also found very frequently, and sometimes in large numbers, the imagos and larvae of *Laemophloeus testaceus*, F., which some authors (Curtis) regard as injurious to grain, while others (Perris) consider it to be a rapacious insect. *Tenebroides mauritanicus*, L., is both injurious to grain and useful in destroying some other insects there; it damages much more than is necessary for its food by devouring the embryo of the grain.

Amongst the moths, *Sitotroga cerealella*, Oliv., is specially injurious in many parts of Caucasia and Transcaucasia; in the western parts of the government of Kutais, in some years it has destroyed the whole harvest of maize; besides which it attacks also wheat, rye, and barley. The author describes the life-habits of this pest as recorded by

Haberlandt, Kollar and others. Some experiments conducted in the Bureau of Entomology by G. V. Zelenko have proved that in order to destroy all the stages of this pest completely at the usual room temperature, 14–16° R (64°–68° F.), in an isolated space, it is necessary to apply not less than 7 lb. of carbon bisulphide for every 1,000 cubic feet during 48 hours; should it be required to get the same results in 24 hours, 10½lb. of liquid are necessary. The samples freed from the pests must be kept in closed spaces and be protected by naphthalene or tar.

Tinea granella, L., is commonly found in Russia in grain warehouses, but the damage done by it is not so great as that done by *Calandra granaria*. As remedies are mentioned the removal of the matted grain by means of rakes, which must be done before the autumn, *i.e.*, before the larvae pass away from the grain to pupate, and the lowering of the temperature of the store by means of ventilation holes, etc. *Trachea (Hadena) basilinea*, Schiff., is very frequently found in Russia in ricks of unthrashed grain, and in stores, and often does great damage. These insects have only one generation during the year, the moths flying in summer, when the grain is developing in the ears, but the caterpillars are found during the whole spring, summer and autumn in different stages. The author describes the habits of the larvae and the damage done by them; during the harvest time most of the caterpillars fall from the ears to the earth, but in the evenings they get back to the sheaves remaining in the fields, and in this way they get into the ricks and barns. During the autumn their activity depends on the temperature, and in warm autumns they do considerable damage. Kiln-drying kills only the caterpillars near the floor of the kiln; by thrashing with chains only some of the larvae are destroyed, while thrashing with machines gives better results; winnowing does not separate them from the grain. Those larvae which remain in the fields feed on fallen grain or on grass, and pass the winter inside the stubble left in the fields. The author recommends that the sheaves should not be stacked in the same field in which they have been cut; should this be impracticable, the sheaves ought to be piled on a clean spot, surrounded by a trench, the latter being also quite clean from straw. The ricks ought to be loose, so as to allow of the ventilation of the pile and the access of fresh cold air, which will make the caterpillars harmless in the ricks till the arrival of warm weather. The caterpillars remaining in the fields can be best destroyed by allowing them to creep during the day underneath straw, spread in the field, which is afterwards burned. In the same way the stubble also must be burned, to facilitate which high-mowing is recommended.

The third group of pests are mites of the family, TYROGLYPHIDAE, the most common representative of which in stored grain and flour is *Tyroglyphus farinae*, Koch; *T. siro*, L. and *T. longior*, Gervais, being found mostly in cheese and less frequently in grain and flour. The author describes the life-habits of this species. According to the experiments of Zelenko on some representatives of the genus *Cheyletus*, living in dry hay and in stored clover seeds, 10½ lb. of carbon bisulphide for a space of 1,000 cubic feet are necessary to destroy the mites within 24 hours.

SACHAROV (N.). **Медвѣдка и мѣры борьбы съ нею.** [*Gryllotalpa vulgaris* and remedies against it.]—*Poster issued by the Entom. Sta. of the Astrachan Soc. of Horticulture and Agriculture, Astrachan*, 28th March 1913.

This poster gives general information as to *Gryllotalpa*, accompanied by figures of the imago, larva, eggs and damaged cabbage root and seeds, and suggests as the only effective remedy to use baits of maize poisoned with arsenic. In order to prepare these baits a mixture of about 3 lb. of arsenic, 6 lb. of lime, and about 36 lb. of maize is boiled together till the grains of maize are quite soft, adding water as it evaporates. The grains of maize ought not to be broken, as the insects may miss them in the earth. Having prepared the baits, the maize is spread on mats to cool, after which it is sown on the infected spot, ½ lb. of maize being used for every 10 cubic sajens [490 cubic feet]. The sowing must be finished 5–7 days before cabbage is sown on the spot; early in spring, when there is no other food, the insects will devour the poisoned baits and perish. In autumn another remedy is recommended, the object of which is to catch the wintering insects; for this purpose holes must be dug about 2–3 feet long, deep and wide, which are filled with well-rotted dung, and covered with earth; the insects enter these holes to hibernate, and at the first frosts they can be turned out and destroyed.

VITKOVSKY (N.). **Краткій обзоръ главнѣйшихъ вредителей и болѣзней культурныхъ и дикорастущихъ растеній въ теченіе 1912 г. въ Бессарабской губ.** [Brief review of the chief pests and diseases of cultivated and wild plants noticed during 1912 in the Govt. of Bessarabia.]—Reprint from **« Труды Бессар. Общ. Естеств. и любит. естествозн. »** [*Studies from the Bessarabian Society of Naturalists and Friends of Nature-study,*] *Kishinev*, iv, 1913, pp. 17.

In an introduction to this review the author points out that the meteorological conditions in 1912 were specially favourable for various pests and diseases of plants. The following insect pests are mentioned in his list. Insect pests of orchards. LEPIDOPTERA: *Cydia* (*Carpocapsa*) *pomonella*, a real scourge throughout the Government; *Cydia funebrana*, Tr., and *C. putaminana*, Stgr., appeared everywhere, attacking plums and walnuts late in the season, but were controlled by some unknown factor; *Aporia crataegi*, L., specially abundant in the "Bessarabian Bukovina," where the butterflies covered trees and earth "like snow"; the peasants there regard it as a sin to collect and destroy the nests of these pests: *Euproctis chrysorrhoea*, L., this and the preceding species were destroyed in their nests by *Parus major*; *Lymantria dispar*, L., *Malacosoma neustria*, L., *Hyponomeuta malinellus*, Z., *H. variabilis*, Z., *Zeuzera aesculi*, L., and *Cnethocampa processionea*, L. COLEOPTERA: *Sciaphilus squalidus*, Gyl., appeared early in spring in enormous quantities; *Rhynchites bacchus*, L., *R. aequatus*, L., *R. pauxillus*, Germ., *R. betuleti*, F., *R. betulae*, L.; *Anthonomus pomorum*, L., yearly destroys the whole harvest in one apple orchard of about 108 acres; *Epicometis hirtella*, L., and *Lethrus apterus*, Laxm. TENTHREDINIDAE: *Hoplocampa brevis*, Klug, *H. fulvicornis*, Klug, *H. testudinea*, Klug. RHYNCHOTA: *Lecanium* sp.

(*rotundum*, Réaum.), found in enormous quantities on plum trees in the "Bessarabian Bukovina"; these pests favour the growth of a fungus disease, *Capnodium salicinum*, Mont., and have led to a marked decrease in fruit-growing in the district; *Lecanium mali*, Schr., chiefly on apple trees; *Aspidiotus ostreaeformis*, Curtis, on pears, less frequently on plums, and only occasionally on apples; *Mytilaspis pomorum*, Bouché, on pears and apples; *Psylla pyri*, L., did serious damage to pears; APHIDIDAE were very abundant during the year, injuring apples, plums and peaches; they were preyed on by numerous *Coccinella septempunctata*, L.; *Tingis pyri*, F., found only once; *Phytoptus pyri*, Pagenst.

Insect pests of vine. *Phylloxera vastatrix*, Pl., found everywhere on old vine stems; *Melolontha melolontha*, L., in some vineyards more than 100 larvae were found underneath one vine; larvae of ELATERIDAE damaged young branches of vine; *Eumolpus vitis*, F., *Phytoptus vitis*.

Insect pests of field crops. *Oscinis frit*, L., v. *pusilla*, Mg., is the most widespread pest in the Government; *Mayetiola* (*Cecidomyia*) *destructor*, Say.; *Chlorops taeniopus*, Mg.; *Anisoplia austriaca*, Hbst.; *Melolontha melolontha*, L.; *Lema melanopus*, L.; *Jassus sexnotatus*, Fall.; various aphides and thrips.

Maize was injured by larvae of *M. melolontha*, L., *Pentodon idiota*, Hbst., ELATERIDAE, and *Pyrausta nubilalis*, Hb.; the spread of the latter pest is favoured by the neglect of the peasants to burn or destroy the maize stubbles, which they keep as food for cattle during the winter and spring, thus enabling the wintering pests to complete their development; the damage done by them is very serious. Winter rape was damaged by *Entomoscelis adonidis*, Pall., *Athalia spinarum*, F., and also occasionally by *Phlyctaenodes sticticalis*, L.; the latter also injured or destroyed melons, maize, vine and other plants. *Cleonus punctiventris*, Germ., was noticed in small numbers on beet; *Otiorrhynchus ligustici*, L., on lucerne; and *Apion apricans*, Hbst., on clover.

Insect pests of market garden crops. *Haltica oleracea*, *H. nemorum*, *Pieris brassicae*, *P. rapae*, *Mamestra brassicae* and *Aphis brassicae* are the usual pests, for which no remedies are applied in Bessarabia.

PACZOSKI (J. K.). **Обзоръ враговъ сельскаго хозяйства Херсонской Губерніи и Отчетъ по Естественно-Историческому Музею за 1912-1913 годъ.** [A Review of Pests of Agriculture in the Government of Cherson and the Report of the Natural History Museum for 1912-1913.]—**Естественно-Историческій Музей Херсонскаго Губ. Земства.**—[*Publ. by the Nat. Hist. Museum of the Zemstvo of the Govt. of Cherson,*] *Cherson*, 1913, 34 pp.

Anisoplia austrica, Hbst., while totally absent in the northern parts of the Government, appeared in the south in numbers, suggesting that a serious outbreak of this insect may occur soon; this has not been the case for the last ten years. The larvae of *Athous niger*, L., damage wheat crops in some localities; while *Epicometis hirtella*, L., injured ears of oats. Two hemipterous insects were noticed on lucerne, which had not previously been observed on this plant, *Adelphocoris*

lineolatus, Goeze, and *Acocephalus rusticus*, F. The former species was noticed on two estates in the northern districts. According to I. V. Vassiliev the insect has two generations in South Russia.. It winters in the egg stage, the eggs being laid in the lower part of the stem of the lucerne stubble; the young bugs issue at the end of the spring and start sucking the tender parts of the plants; in the first half of July they reach their mature stage, ovipositing again in the autumn. Insecticides are of no avail, and the only remedy recommended by Vassiliev consists in destroying the wintering eggs by slightly burning the lucerne stubble. To effect this, the field of lucerne is covered with a loose and even stratum of straw of a thickness of about 3½ inches, which is burned in suitable weather, viz., dry, with a slight wind; the flame should pass rapidly and evenly over the field.

Vassiliev reports favourable results obtained by this method in the Government of Ekaterinoslav, and points out that the slightly burned plants of lucerne gave good new shoots. As to *Acocephalus rusticus*, F., its life-habits are little known; it appeared usually in company with *Adelphocoris lineolatus*, so that the particular damage done by it could not be ascertained. *Macrosiphum pisi*, Kalt., was also found on lucerne, where, however, these lice do not multiply to a dangerous degree, they being chiefly pests of peas.

Phlyctaenodes sticticalis, L., appeared this year in many parts of the Government, injuring lucerne, maize, sunflower and potatoes; they did not touch *Sisymbrium losselii*, L., but were found frequently on *S. sophia*, L., also on *Artemisia*. *Lethrus cephalotes*, Laxm., did some damage to linseed crops in the district of Cherson.

Epicometis hirtella, L., was found this season in lesser numbers than in previous years and has done damage only in some localities. In the environs of Cherson it attained its greatest numbers at the time of blossoming of the cherry trees, which suffered most from its attacks, The author experimentally tested the remedy recommended by J. F. Schreiner, namely, trapping the beetles on sheets of blue paper covered with an adhesive. He concludes that the method is of no practical value, as the insects did not show any preference for the blue sheets. It was noticed that the insects did not pay any attention to the blue flowers of *Chorispora tenella*, D.C., which grew underneath the cherry trees, or to other blue flowers, concentrating only on the blossoms of cherries. The same negative results from adhesive blue sheets were also reported from Turkestan with *Oxythyrea cinctella*, and from Kishinev.

The following insects injurious to orchards have been noticed. *Hyponomeuta malinellus*, Z., *Euproctis chrysorrhoea*, L., *Malacosoma neustria*, L., *Cydia* (*Carpocapsa*) *pomonella*, L., *Acronycta tridens*, Schiff., *Coleophora hemerobiella*, Sc., *Phalera bucephala*, L., *Hylotoma rosarum*, F., *Tingis pyri*, F., and *Aphis ribis*, L.

For the first time during his sixteen years' experience the author met with *Psylla pyricola*, Först., and it raises the question whether the pest has only this year invaded the Government, or whether it has existed there previously without being able to develop to a noticeable degree, owing to some unfavourable conditions; as a remedy, dusting with tobacco is suggested. *Eumolpus vitis*, F., was also

noticed on vine for the first time in the Government, though known previously in Bessarabia. *Phytoptus pyri*, Sor., has done substantial damage in some localities, and occurred in considerable numbers. The following forest pests are reported. On oaks, two species of the genus *Haltica* appeared in some localities, the most serious damage being done to single trees and small scattered groups of trees on pasture land; oaks in enclosures, where no grazing took place, suffered less, or not at all. Leaves of elm trees were injured by *Galeruca xanthomelaena*, Schr. *Claudius viminalis*, Fall., were found on poplars in Cherson, there being evidently two generations of the pest in the Government.

Larvae of *Cimbex amerinae*, L., or a similar species, were noticed on *Salix acutifolia*, W., on the sands in the valley of the river Dnieper; the leaves were sometimes totally devoured, only the veins remaining. *Lecanium robinarium*, Dougl., is increasing in the Government; in the year under report they were found on *Corylus avellana*, and on maples in some localities.

WEBSTER (F. M.) & PARKS (T. H.). **The Serpentine Leaf-Miner.**—*Jl. Agric. Research, Washington*, i, no. 1, Oct. 1913, pp. 59–87, 17 figs., 1 pl.

The serpentine leaf-miner is the larva of *Agromyza pusilla*, Mg., a minute yellow and black fly, which is common in alfalfa fields during the summer; it has a wide range of food-plants, and is generally distributed over the United States. Outside the United States the species has been found in central and northern Europe, Italy, Sicily, and Egypt.

The larvae injure the foliage of the plant by devouring the parenchyma of the leaf; leaves of white clover and of young alfalfa often having the entire cellular tissue devoured, leaving only the two membranes. Usually only one larva is present in each leaf. The injury is greatest in the south-western States, where the discoloured leaves are sometimes present in sufficient numbers to lower materially the quality of the hay. The injured leaves can be found in the fields from May until November, the larvae continuing to feed until the frosts; in Florida the larvae feed throughout the winter, but usually the insect hibernates in the puparia beneath the surface of the soil at the base of the plants. There are five or six generations in lat. 41°, the number varying with the length of the growing season. The generations overlap to such an extent that all stages can be found in the fields during most of the season. During the period of highest temperature in summer, the larvae are usually found infesting plants protected from the direct rays of the sun; in the south-west the insect almost completely disappears from the fields at this time, reappearing in September.

The eggs are deposited in the leaf tissue, and are inserted in punctures identical with those made by the adult in feeding; the eggs take 4 days to hatch in June, the larval period being then 4 days. In the eastern States pupation occurs entirely in the soil; in the more

arid western States it takes place usually in the larval chambers in the leaf; the pupal period in June is 10 days. The average period of the complete life-cycle is 23 days.

Besides alfalfa, clover, cowpeas, rape and cotton are subject to attack. A few nearly-related and very similar leaf-miners are known to attack timothy, wheat, oats and grasses; when these crops are affected, the mine usually extends the entire width of the leaf, and may kill the plant if it is very young.

Numerous parasitic insects attack and consume the larvae and pupae within their mines; these are highly efficient and keep the insect under control. The following is a list of these parasites:—*Diaulinus begini*, Ashm., *D. websteri*, Cwfd., *Chrysocharis ainsliei*, Cwfd., *C. parksi*, Cwfd., *Derostenus arizonensis*, Cwfd., *D. diastatae*, How., *D. punctiventris*, Cwfd., *D. pictipes*, Cwfd., *D. varipes*, Cwfd., *Diaulinopsis callichroma*, Cwfd., *Cirrospilus flavoviridis*, Cwfd., *Zagrammosoma multilineata*, Ashm., *Closterocerus utahensis*, Cwfd., *Pleurotropis rugosithorax*, Cwfd., *Eucoila hunteri*, Cwfd., *Sympiesis* sp., *Pteromalus* sp., *Cirrospilus* sp., *Diaulinopsis* sp., and a species of ENTEDONINAE. Braconid parasites include *Opius agromyzae*, Vier., *O. aridus*, Gahan, *O. brunneipes*, Gahan, and *O. suturalis*, Gahan. The following are predaceous upon the serpentine leaf-miner: *Triphleps* sp., and *Erythraeus* sp. Most of these parasites are functional in the control of more than one species of leaf-miner, and are very widely distributed.

Frequent cutting of alfalfa kills the larvae in the leaves, and does much to protect this crop; this method should be followed where the injury becomes serious. Deep autumn or winter ploughing is advocated for annual forage crops and cereals, in order to bury deeply the hibernating puparia located near the surface of the ground.

DE CHARMOY (D. d'E.). **Summary of investigations on Insect Pests during the three months, May-July, 1913.**—*Mauritius Dept. of Agric., Div. Entom.*, 27th July 1913, 2 pp.

The sugar-cane leaf aphis (*Aphis sacchari*). By the middle of June fields severely infested by these plant-lice were noticed on two plantations. As predaceous insects, such as SYRPHIDAE and COCCINELLIDAE were found at work, no remedy was suggested. A fortnight later the pest was found to have been completely checked by a fungus disease, and the plants were rapidly recovering.

In June the manager of the Bassin Estate found White Tannas diseased. These were uprooted, and the damage was found to be due to "moutoucs" (*Oryctes* and *Lachnosterna* larvae). The larvae were dug out, and with them a certain number of *Scolia rufa*, which were proved to be parasites of the *Oryctes* larvae.

Chionaspis tegalensis. Samples of sugar-cane received from Industry Estate, Long Mountain, were found heavily infected with this scale-insect, and about five acres of another plantation were entirely covered with this pest. Early cropping and burning of the canes before cutting have been suggested as a means of getting rid of the insect.

The sugar-cane white louse (*Pseudococcus calceolariae* var. *sacchari*). Young virgin canes were found suffering from this scale-insect, which was attacking the roots, this being due to infested cuttings not having

been disinfected. A fungus disease was keeping down the Coccid, the aggregated insects being reduced to a sort of pulp. For disinfecting the cuttings kerosine mixture has been suggested. For this mixture, to 25 grams of soap disolved in 500 c.c. boiling water, add 2 litres petroleum, gradually stirring the while; add to 600 c.c. of this emulsion, 400 c.c. of Phenyl, or 300 c.c. of Creolin. This mixture at a strength of 1 per cent. in water damages green leaves, and should only be employed for disinfecting the soil or against scale insects attacking the bark.

HARDENBERG (C. B.). **Peach-tree Aphides.**—*Agric. Jl. Union S. Africa, Pretoria*, vi, no. 2, Aug. 1913, pp. 224–235.

During the winter and early spring of 1912, the author made some observations and experiments regarding the life-history and control of the black and green peach aphids [*Aphis persicae*, Boyer, and *Rhopalosiphum dianthi*, Schr.] in the Pretoria and Johannesburg districts, where the two insects are generally very prevalent, and may cause a complete failure of the peach crop in some localities. The observations can be divided into such as relate to (*a*) life-history, including hibernation and dispersal; (*b*) parasitism; and (*c*) the use of tobacco extract as a means of control.

The following summary is given of the results of the experiments:—

(1) In sheltered situations the black peach aphis probably hibernates on the trees, and may breed through the winter; (2) though primarily infesting the young shoots and fruit-buds, the black aphis will also attack the leaves; (3) dispersal takes place most probably through the agency of winged individuals, which are produced as soon as a favourable mean temperature is reached; the distribution is too scattered to admit of its being effected by ants carrying the young aphides to other situations on the tree; (4) the presence of aphis at the base of the flower-bud causes it to swell and open prematurely, or at least in advance of others which are not attacked by aphides; (5) the green peach aphis breeds in the winter on cabbage, parsnips, and probably other cruciferous plants; (6) in the absence of definite data regarding the season history of the black aphis parasite, we may presume that the hibernating colonies keep this parasite breeding through the winter season; (7) the black peach aphis is attacked by one hymenopterous internal parasite and preyed upon by two species of Syrphid flies and three species of lady-birds; (8) the total length of the life-cycle of the Syrphid, *Xanthogramma scutellaris*, is about three weeks; egg stage, three to four days, larval stage about twelve days, and pupal stage five days; (9) the Syrphid pairs in late afternoon; eggs are deposited at intervals of about one minute; (10) tobacco extract in a solution containing about 0·082 per cent nicotin is the most effective strength; no advantage is gained by using a stronger solution; this kills the aphis within 24 hours, being equivalent to a dilution of "Eagle Brand" extract of 1:100, and of "Lion Brand" extract 1:80; (11) the tobacco wash is more effective in sunshine than in dull cloudy weather; (12) green peach aphis can be effectively kept under control by three thorough sprayings about five days apart, the first being applied as soon as the first leaves open out; the first appearance of the aphis should be watched for closely; (13) for effective spraying an underspray attachment is essential; the spray should

be applied along the branch from below (towards the tip of the branch or twig), as the force of the spray will momentarily open the curled-up leaves; (14) the use of soap at the rate of 1 lb. in 25 gallons of spray is advisable; (15) the cost of the application should not exceed 1*s.* 6*d.* per tree for the three sprayings together; (16) by means of these three sprayings a good crop of peaches can be secured, even in heavily infested orchards; (17) clean cultivation between the trees is advised; cabbages, parsnips or cruciferous vegetables should not be grown during the winter in or near the part of the garden where peach trees are standing, as they furnish breeding places for the green peach aphis.

In a note by Mr. Lounsbury it is stated that the above report on spraying tests concerns the green peach aphis. The black species is commonly found during winter; and when it has to be combated, it is is advisable to take advantage of the nakedness of the twigs, by making a thorough application of the spraying preparation shortly before the buds open. Should three sprayings, as recommended, not suffice for the control of the green species, as may be the case in seasons which particularly favour the pest, applications at intervals of about five days should be continued.

Van Dine (D. L.). **Report of the Entomologist.**—*Expt. Sta. of the Sugar Producers' Assn. of Porto Rico, Rio Piedras, P.R., Bull.* no. 5, Aug. 1913, pp. 25-46.

In this report the author states that the May-beetles and their white grubs form the first line of his work, since the control of these insects is the most acute problem before the planter. The following is a list of the insects affecting sugar-cane in Porto Rico, together with their natural enemies, and an indication of the injury they cause:—

(1) The moth stalk-borer (*Diatraea saccharalis*, F.) tunnels into the cane stalk; kills young cane; affects the germination of seed cane. Its enemies are an egg-parasite, *Trichogramma minutum*, Riley; a Tachinid fly, *Tachinophyto* (*Hypostena*) sp.; and a fungus, *Cordiceps barberi*, Giard; (2) May-beetles and white grubs (*Lachnosterna* spp.) The adults feed upon the leaves, and the larvae upon the roots and the root-stalks externally; their enemies are: a wasp, *Elis sexcinta*, F.; the Tachinid flies, *Cryptomeigenia aurifacies* and *Eutrixoides jonesii*; an Elaterid beetle, *Pyrophorus luminosus*, Ill.; a fungus, *Metarrhizium anisopliae*, Metsch.; "blackbirds" (*Crotophaga ani* and *Holoquiscalus brachypterus*); (3) the weevil root-borer (*Diaprepes spengleri*, L.), whose larvae feed within the root-stalk and prune the roots to some extent; the blackbirds, noted under *Lachnosterna*, feed upon its larvae at ploughing time; (4) Rhinoceros beetles (undetermined Dynastids). Their larvae feed upon the roots, and within the root-stalk; the fungus, *Metarrhizium anisopliae*, and the blackbirds, both noted under *Lachnosterna*, are natural enemies; (5) The Mealy-bug (*Pseudococcus sacchari*, Ckll.), feeds on the underground portions of young cane, at the base of the leaves, and beneath leaf-sheaths of older cane; the introduced ladybird beetle, *Cryptolaemus montrouzieri*, Muls., and the parasitic fungi, *Aspergillus* sp. and *Isaria* sp., are natural enemies; (6) the mole-cricket (*Scapteriscus didactylus*, Latr.), eats into seed cane and the young shoots beneath the surface of the ground; natural enemies are the blackbirds and lizards; (7) the southern grass-worm

(*Laphygma frugiperda*, S. and A.), the larvae of which eat leaves of young cane. A Braconid, *Chelonus insularis*, Cress. (?); the Tachinid flies, *Frontina archippivora*, Will., *Gonia crassicornis*, F., and *Archytas piliventris*, Wulp; a Carabid beetle, *Calosoma alternans*, F.; the fungi, *Botrytes* sp. and *Empusa* sp., and the blackbirds are natural enemies; (8) the grass-looper (*Remigia repanda*, F.), the larva of which eats leaves of young cane, the natural enemies being Tachinid flies and a Carabid beetle, *Calosoma alternans*, F.; (9) the West Indian sugar-cane leaf-hopper (*Delphax saccharivora*) feeds on leaves and stalks of young cane; its natural enemies are: a Mymarid, a Dryinid and a *Stylops*; (10) the sugar-cane Aphid (*Sipha graminis*, Klt.) feeds on the leaves; its enemies are: a Syrphid fly, *Ocyptamus* sp.; lady-bird beetles, *Cycloneda sanguinea*, L., *Megilla innotata*, Muls., *Scymnus loewii*, Muls., *S. roseicollis*, Muls.; a lace-wing fly; a fungus, *Acrostalagmus* sp.; (11) the hard-back or black night-beetle (*Ligyrus tumulosus*, Burm.), the larva of which is found at the roots, and is attacked by a wasp, *Campsomeris dorsata*, F.; (12) the weevil stalk-borer (*Metamasius hemipterus*, L.), follows disease or other injury, infesting both stalks of growing cane and seed cane; no enemies have been observed; (13) the shot-hole stalk-borer (*Xyleborus* sp.) follows disease, usually the rind disease (*Melanconium sacchari*), in the stalks and seed cane; no enemies have been observed; (14) the grass-worm (*Cirphis latiuscula*, H. S.), eats young leaves; a Braconid (undetermined) and the blackbirds are natural enemies; (15) a Skipper (*Prenes nero*, F.), whose larva eats young leaves; it is parasitised by a Braconid; (16) the scale-insect, *Targionia sacchari*, Ckll., parasitised by a Chalcidid; (17) the green Diabrotica (*Diabrotica graminea*, Baly), the adults of which feed on the leaves to a slight extent; the habits of the larva are not known; no enemies have been observed; (18) a termite (*Eutermes morio*, Lath.), attacks the seed and does not appear to have any enemy; (19) an undetermined Tineid, attacks the base of young shoots and eyes; no enemy has been observed; (20) mites have been observed to feed upon the stalks beneath the leaf-sheath and upon the leaves; no natural enemies observed.

An extensive bibliography of 41 works, containing papers on Porto Rico sugar-cane insects follows. From this list the author gives a general summary, referring to the injurious species according to the part of the plant they affect.

It was in 1910 that the larvae of the so-called Rhinoceros beetles were discovered, and in 1911 about 15 acres of cane were found infested to a serious extent by them. Thus far the insect has been observed breeding at the roots of cane only on the south coast of the island; it is also found in old wood in the forest. The grubs are eaten by the blackbirds at ploughing time, and the local form of the parasitic fungus, *Metarrhizium anisopliae*, also attacks them. The plantation practice of planting cane by opening up new furrows between the old rows without first ploughing out the old stubble, greatly favours the development of the grub of the Rhinoceros beetle, and of the white grub of the May-beetle. The old stubble should be thrown out, as then the blackbirds are able to feed upon the grubs, and the latter may also be picked up and destroyed. It seems probable that this Rhinoceros beetle is a species recorded under the name of *Strategus titanus* from the islands of St. Croix and Jamaica, as a pest of the

sugar-cane, and which is also recorded from Porto Rico by Stahl. The weevil root-borer (*Diaprepes spengleri*, L.), which in the larval stage attacks the roots of sugar-cane, must now be added to the list of borers affecting the plant in Porto Rico. The adult weevil has already been recorded as an enemy of citrus trees, and as common in coffee plantations, and was stated to have other hosts, as the guava, avocado, mango and rose. The author has observed the adult weevil feeding on the leaves of the sugar cane and on those of the "jobo," *Spondias lutea*. The blackbirds feed upon the weevil root-borer at ploughing time. Generally, the measures of control would be collecting the grubs and adults.

SCHWARTZ. **Nikotin als Insektengift.** [Nicotin as an Insect Poison.]—*Mitt. k. biol. Anst. für Land- und Forstwirtschaft, Berlin*, viii, 14th Sept. 1913, pp. 36-37.

Laboratory experiments were made to find the effect of nicotin and its salts upon insects. Besides pure nicotin the following salts of it were used:—lactate, acetate, trichloracetate and nitrate. All these substances, in 0·015% solution, acted as a skin poison upon Aphids (*Rhopalosiphum ribis*). Solutions containing 0·025% of the substance killed 93-98% of the Aphids. As an internal poison, 0·05% solutions were effective for caterpillars of *Vanessa polychloros*, *V. io*, and *Orgyia antiqua*; 0·2% solutions for caterpillars of *Lymantria dispar* and *Stilpnotia salicis*; and 1% solutions for *Malacosoma neustria*. Poisoned food affected only the caterpillars of *Vanessa io* and *polychloros*. In the cases where the caterpillars of these species ate leaves sprayed with nicotin compounds, they pupated imperfectly, and in no cases were butterflies produced from them. The spray solution used was 0·05% in strength. The difference in action of the several compounds of nicotin used was not worked out.

The following Series of Abstracts is taken from **«Садъ, Огородъ, и Бахча*»** [**Orchard, Market Garden & Bachza.**]—*The Journal of the Astrachan Society of Fruit-Growers, Market-Gardeners & Agriculturists, Astrachan.*

SACHAROV (N.). *Opatrum sabulosum*, L., **какъ вредитель бахчевыхъ растенiй въ Астраханской г. и подсолнуховъ въ Саратовской.** [*Opatrum sabulosum*, L., as a pest of cucurbitaceous plants in the Govt. of Astrachan and of sunflower seeds in the Govt. of Saratov.]—*Orchard, Market-Garden & Bachza*, 1913, Reprint, 2 pp.

The larvae of this Tenebrionid beetle in their life-history, and in the character of the damage done by them, resemble the larvae of *Agriotes lineatus*, L. The author points out, therefore, that not all the injury

*[The Tartar word **Бахча** (Bachza) is used in South and South Eastern Russia of fields set apart for the cultivation of various species of melon, chiefly water melons, the yield varying from 110 to 300 melons per acre. These fields are only used for this purpose for one year, after which they are given up to ordinary crops. In some parts of the chornoiziom area cucumbers and other vegetables are grown on these fields.—Ed.]

attributed to the latter pests is really done by them. He obtained this year, some larvae from the Zemstvo of Saratov, which have damaged sunflowers, and from them he reared some *O. sabulosum*, the remaining larvae producing *A. lineatus*, and another unidentified beetle. In the same way he obtained an imago of *O. sabulosum* from some larvae which were damaging lemons in the Government of Astrachan.

These insects live during the whole summer, often hiding underneath stones or dry cattle-dung; they are found in large numbers in both the above Governments, and in the opinion of the author, about 90 per cent. of the damage to "bachza" plants in Astrachan, usually attributed to the larvae of *A. lineatus*, is really done by the former pest when the larvae of *Euxoa segetum* are absent.

The author describes the larva, pupa and imago of the *Opatrum*. As to remedies, further investigations will, he says, be necessary.

VOSTRIKOV (P.). **Коротды** [Bark Beetles.]—*Orchard, Market-Garden and Bachza*, Feb. 1913, pp. 40-41.

The habits of *Eccoptogaster rugulosus*, Ratz., and *E. mali*, Bechst., are very similar, and both injure mostly cherry trees and plum trees, but also apple, pear, apricot, etc. There are two generations; the first occurring from the first half of May till the end of July, the second from July till the end of summer. The control of the insects is not an easy matter, the part played by parasites being minimal, and insecticides being of little avail. As preventive remedies, the author recommends smearing over the trunks of trees early in spring, before the opening of the buds, with 3 per cent. solution of iron-sulphate, or with a mixture of milk of lime with iron sulphate (1 lb. of the latter in about 2·7 gallons of water). As to destructive remedies, the cutting in spring of those branches which have no leaves, the cutting out of the larvae from the trunks in May and June, smearing over the wounds with lime and clay, or with garden tar, are recommended. It is also useful to plug the openings on the bark and any wounds with a mixture of one part of carbolineum with two parts of lime. *Sorbus* and *Crataegus* ought to be excluded from gardens or used as bait trees, and burned afterwards. In the same way damaged trees ought also to be burned, as well as injured branches, etc.

RASTEGAJEV (P.). **Наилучшій способъ уничтоженія медвѣдки въ садахъ и огородахъ.** [The best method of destroying *Gryllotalpa* in orchards and in market-gardens.]—*Orchard, Market-Garden and Bachza*, Feb. 1913, pp. 41-42.

The author describes, generally, the damage done by these pests to orchards and market gardens, which in south-eastern Russia is enormous. He recommends a new remedy, which he considers superior to all those usually recommended, such as (1) bait-holes; (2) poisoning by maize; (3) destruction of the nests with eggs; (4) spraying of the soil with carbon bisulphide; (5) moistening of the beds with a mixture of water and carbon bisulphide; (6) addition of turpentine to the water used for watering the beds, etc. His remedy consists in pouring naphtha into the burrows of the insects. For this purpose

a jug containing water and naphtha, the latter keeping on the surface of the water, is used; having found a burrow, the naphtha is first poured in, either through a special tube attached to the lip of the jug, or by simply pouring it over the edge; then water is poured in so as to drive the naphtha into the hole; one half to 1 pint of water over some naphtha proves sufficient to drive out the insect, and it perishes soon afterwards. He reports that in this way a boy (whose daily wages were 25 copecks – about 6*d*.), has destroyed 300 insects in a day. The author has also invented a special jug, with two tubes, and two separate compartments for water and for naphtha.

SACHAROV (N.). **Гусеница бабочки** *Evergestis extimalis*, Sc., **какъ вредитель нѣкоторыхъ огородныхъ культуръ.** [The caterpillar of *Evergestis extimalis*, Sc., as a pest of some market-garden crops.]—*Orchard, Market-Garden and Bachza*, March 1913, pp. 160-161, 3 figs.

It has not been previously reported that the caterpillars of *Evergestis extimalis*, Sc., injure cruciferous plants, but during last summer they have been noticed damaging sprouts of radish and turnip in one experimental nursery in the Government. The author describes and figures the imago and the caterpillar, and figures also a damaged pericarp. The eggs are deposited on the pericarps and the caterpillars feed on the seeds. Pupation takes place on the same plants on which the caterpillars have fed, between the leaves or the branches of the stalks. It is assumed that there are two generations, the second one breeding on wild Cruciferae. Paris green may serve as an insecticide, as the insects feed also on the outer parts of the fruits.

SACHAROV (N.). *Oecanthus pellucens* Scop., **какъ временный сожитель виноградной лозы.** [*Oecanthus pellucens*, Scop., as a temporary parasite of vine-branches.]—*Orchard, Market-Garden and Bachza*, April 1913, pp. 193-196.

The tree cricket, *Oecanthus pellucens*, oviposits inside the summer branches of the vine, laying two, and sometimes three eggs in one hole; the larvae emerge from the egg in the following spring, the imago appearing in July. The author is of opinion that this insect is rather useful than injurious, as from the moment of its hatching out till late in the autumn, it destroys plant-lice wherever it can find them. As to the oviposition on vine, the insect only casually visits this plant, and the damaged branches do not suffer from the piercing, as the openings grow over again later. As it oviposits also on those parts of the summer branches which are cut off and burned before the winter, numbers are destroyed. In Astrachan the insect survives by depositing its eggs over the winter on *Rubus caesius*, L.

SACHAROV (N.). **Отъ Энтомологической станціи Астраханскаго Общества Садоводства, Огородничества и Плодоводства.** [Notes from the Entomological Station of the Astrachan Society of Horticulture and Agriculture.]—*Orchard, Market-Garden and Bachza*, April 1913, pp. 196-200.

The author calls attention to the appearance of a Chrysomelid

beetle, the larvae of which mine the leaves of garden strawberries. On some leaves as many as 270 eggs were found, and the larvae threatened to destroy the whole crop of strawberries. He suggests spraying the plants with Paris green, repeating the spraying later when the ovaries are well formed. The insecticide must be used in a proportion of 1 oz. of green and 2 oz. of lime dissolved in 7 gallons of water.

In some parts of the Government larvae of a Galerucid beetle, *Leptosonyx silphoides*, appeared, moving in large numbers over the steppes, after the manner of *Phlyctaenodes sticticalis*; the author is, however, of opinion that this insect feeds only on wormwood, not touching cultivated plants.

Recipes are given for one insecticide and two fungicides. The insecticide is recommended against pests of the vine, and consists of a solution of 2½ lb. sulphate of iron in 23½ ga's. water, with which the young buds are to be sprayed in early spring.

SACHAROV (N.). **Азіатская саранча въ низовьяхъ Волги и борьба съ нею.** [Asiatic locusts in the lower parts of the Volga, and the fight against them.]—*Orchard, Market-Garden and Bachza*, July and Sept. 1913, pp. 436-440 & 559-563, 11 figs.

The southern parts of the Government of Astrachan, along the banks of the Volga and of the Caspian Sea are most suitable places for the breeding of Asiatic locusts (*Locusta migratoria* and *L. danica*); the coasts are covered with reeds, there being also various meadow plants, and the soil is suitable for the oviposition of these insects. The people in these parts are mostly fishermen, and, therefore, the damage done by the pests is usually disregarded, the locusts appearing every year without exception. Oviposition takes place at the end of August and during September on friable, sandy or loamy soil, and the hatching begins in May. The spring floods of the Volga destroy large numbers of eggs, and the author is of opinion that if this were not the case, the locusts would become so numerous as to threaten even many central Governments of Russia.

The following parasites of locusts are mentioned:—*Sarcophaga lineata*, Fall., which mostly parasitises the larvae, and another fly of the genus *Anthomyia*, which attacks the winged insects. Besides these flies, the following insects prey on the eggs of the locusts:—*Epicauta erythrocephala* v. *latelineolata*, *Mylabris calida*, and the larvae of flies of the genus *Systoechus*; the latter being found by the author in 20-25 per cent. of the egg-clusters.

The difficulties in combating the insects are considerable, owing to the situation of the breeding places among flooded reeds, and the lack of workmen on the spot, etc. The method adopted was spraying with Paris green (1 lb. of green, 4 lb. of milk of lime, and 2 lb. of a special glue, in about 14 gallons of water); for the later larval stages the insecticide was made even stronger.

RASTEGAJEV (P.). **Мои случайныя наблюденія за вредной дѣятельностью арбузнаго червя.** [My casual observations on the injurious activities of the Melon-Worm.]—*Orchard, Market Garden and Bachza*, Sept. 1913, pp. 565-568.

The name of "melon-worm" is applied to the larvae of *Euxoa segetum*, and the damage to melons was observed only in the first half

of June, when many of the young sprouts were destroyed. Hand-picking at night was adopted, and the remaining plants were saved, 500 caterpillars having been collected on a space of 2 acres. The author also suggests spraying with Paris green (about 1½ oz. of green in about 2·7 gallons of water).

RYSHKOV (N.). **Мышьяковистая известь и парижская зелень, какъ инсектисиды.** [Calcium arsenate and Paris green as insecticides.] —*Orchard, Market-Garden and Bachza*, Oct. 1913, pp. 643-644.

The author reports the results of spraying with the above-mentioned insecticides in various orchards. In one case calcic arsenate was used, prepared as follows:—1 lb. of arsenic with 1½–2 lb. of soda, being boiled in about 2·7 gallons of water till the arsenic was quite dissolved, which took about an hour; after this some 5 lb. of lime was added and boiled for another half an hour; this solution was made up to 270 gallons with water. Although there were rains during the spraying, and this was not repeated, the results obtained were excellent; and, whereas, during the previous year, *C. pomonella* destroyed more than three-quarters of the harvest in this particular orchard, no specimens of the pest were noticed this year. In another orchard the spraying was done with Paris green dissolved in sal-ammoniac, the amount of the latter being just sufficient to dissolve the green, and 1 oz. of this mixture was dissolved in 19 gallons of water; while in a third orchard the insecticide used was Paris green with lime (about ½ oz. in 2·7 gallons of water). The results obtained were favourable with regard to *Hyponomeuta malinellus*, the larvae of which perished after 3-4 days, keeping all the time on the ends of the branches; while the activity of *C. pomonella* was practically unaffected.

LONG (H. C.). **The Large Larch Sawfly.**—*Gardeners' Chronicle, London*, liv, no. 1394, 13th Sept. 1913, pp. 184-185, 1 pl.

The Large Larch Sawfly, *Nematus erichsoni*, has caused much damage in Britain since 1904; up to that time it had not proved harmful, but in 1904 it was observed in injurious numbers in Cumberland, and in 1905 it was reported as having wrought great havoc, and again in 1906. Since that time larch woods have suffered much from this insect, which has now been scheduled as notifiable to the proper authorities. In 1908, in Keswick, 200 acres were attacked, and hundreds of the trees had died; on Skiddaw alone 30,000 trees had to be felled in 1912 on account of the pest. This sawfly has been recorded in Germany, Switzerland, Holland, Denmark, Sweden, Finland, the United States, and Canada.

The damage is done by the larvae, which feed voraciously on the foliage of the larch; trees of any age may be attacked. Repeated defoliation may kill the tree. When full-fed the larvae enter the moss or soil beneath the trees and spin strong brownish cocoons, in which they pass the winter, pupating in the spring. The flies emerge from May to July, during which time eggs are laid. Hewitt found that development was parthenogenetic.

The sawfly is subject to attack by a number of parasites, chiefly the Ichneumon, *Mesoleius aulicus*, which is responsible for the death of

large numbers of the insect, to the extent sometimes of 70 per cent. A fungus (*Cordiceps*) also infests the cocoons.

Since tall trees are attacked, remedial measures against the infestation are rendered more difficult. Means of combat include crushing the larvae when near enough to the ground; poisoning by spraying with lead arsenate or Paris green; and destroying the cocoons in the soil, under the trees, during the winter.

LONG (H. C.). **The Cherry Fruit Fly.** *Gardeners' Chronicle, London,* liv, 18th Oct. 1913, p. 271, 1 pl.

The Cherry Fruit Fly (*Rhagoletis cerasi,* L.) has been known on the Continent for a long time; but English cherries do not appear to have ever been attacked. Affected cherries are, however, constantly imported into England, and in consequence it is not impossible that the pest may at any time establish itself in this country. Theobald says that should it become noticeable in any plantation or garden, it would be wise to forego the crop by having the fruit destroyed to prevent damage another year, and the possible spread to other plantations.

The Cherry Fly may be combated by the collection and destruction of affected cherries; giving poultry the opportunity of picking up fallen cherries and maggots, as well as pupae in the soil; combined with surface cultivation in autumn and winter, to expose the pupae to birds and the rigours of the weather.

Plant Bugs on *Hevea brasiliensis.*—*Jl. Board Agric. of Br. Guiana, Demerara,* vii, no. 2, Oct. 1913, p. 74.

An increase of the Pentatomid Bug, *Empicoris variolosus,* is reported. These are difficult to detect, as during the day they hide in depressions of the bark, old tapping wounds, etc. It is supposed that they cause exudation of the latex from young green shoots by sucking them. The matter is under investigation.

THEOBALD (F. V.). **The British Species of the Genus** *Macrosiphum,* **Passerini. Pt. II.**—*Jl. Econ. Biol., London,* viii, no. 3, 29th Sept. 1913, pp. 113–154, 29 figs.

In the first part of this paper (Jl. Econ. Biol., viii, No. 2) [see this *Review,* Ser. A., i, p. 332], a list of fifty-five British species of the genus *Macrosiphum* was given, and of these twenty-five were described. The present part deals with the remaining species, and five more are added to the list, bringing the number up to sixty. Of these, twelve species are new.

FELT (E. P.). **Twenty-eighth Report of the State Entomologist, 1912.**—*Bull. N.Y. State Mus., Albany, N.Y.,* no. 165, 15th July, 1913, 264 pp., 79 figs., 14 pls.

The authorship of the above paper, of which an abstract was given on p. 527, Vol. i., Series A., was attributed in error to the Director of the Museum instead of to Dr. E. P. Felt.

The reference should read as above.

NOTICES OF ENTOMOLOGICAL APPOINTMENTS, &c.

Mr. NOWELL, the Assistant Superintendent of the Local Department of Agriculture, Barbados, who was principally engaged upon Mycological and Entomological work, has resigned, and has now been appointed as Mycologist to the Imperial Department of Agriculture, Barbados. Mr. J. SYDNEY DASH, B.Sc., has been appointed in his place, and is expected to take up his duties in February.

Mr. C. F. C. BEESON, Indian Forest Service, has been appointed Forest Zoologist to the Government of India on the resignation of Dr. A. D. Imms.

BODKIN (G. E.). **A New Insect Pest of Coconut Palms in British Guiana,** *Castnia daedalus*, **Cramer.**—*Jl. Board Agric. of Br. Guiana, Demerara*, vii, no. 2, Oct. 1913, pp. 87–90.

The author states that in a coconut palm, well advanced in growth, the presence of the larva of this moth is easily detected, the signs of attack consisting of deep, irregular, longitudinal scars or furrows, running up the trunk of the palm in continuous lines, often 3 to 4 feet in length. The larvae themselves live in the burrows, which they make between the trunk of the tree and the broad and thickened bases of the leaves. In cases of severe attack, the trunk of the palm immediately beneath the crown may become so weakened that a strong gust of wind will cause the head to snap off. Frequent cases of this are to be observed on the Demerara River. The financial loss occasioned by this pest is an exceedingly serious matter, especially as the adult insect is winged, and capable of sustained and powerful flight. Descriptions of the various stages of the insect follow, but as regards the life-history little is known at present, any close investigation being an exceedingly difficult matter. The moths themselves are entirely nocturnal, and may at times be seen on the wing at dusk. Drastic measures are necessary to prevent further damage in the case of a heavily infested palm. All the lower leaves have to be carefully removed by cutting them away at the base and securing the larva. In this way as many as 19 larvae and pupae of *Castnia daedalus* have been taken from a single palm. Palms in an infected district should be examined at regular intervals for the presence of this pest, and to this end, the lower and older branches should be regularly removed, and the tree kept generally clean. No natural enemies have been discovered so far, but *C. daedalus* does not appear to infest palms inhabited by the so-called "Kop-Kop" ants.

Sugar-cane Pests in British Guiana.—*Agric. News, Barbados*, 16th & 30th Aug. 1913, pp. 226 & 282.

The large moth borer (*Castnia licus*) was present on most estates in 1912, the grand total of insects captured in all three stages on seventeen estates being 1,018,901, as against 2,384,430 for 1911. This decrease is stated to be due to nine months' extreme drought, and to the excellent work of collecting in 1911. The conclusions regarding methods of control are:—(1) Long-continued drought affects the insect adversely; (2) the peristent and vigorous collecting of caterpillars and pupae in the stools of canes is the most efficient method of fighting this pest; (3) the collection of the moths is a very useful practice; (4) birds may be encouraged by means of perches in the cane-fields, and these are useful aids in the control of *Castnia*; (5) continued warfare must be kept up against this pest until it is reduced to very small numbers over a series of years; a decrease for one year should not be taken as a reason for ceasing control operations; (6) continued efforts on one estate, or on a group of estates may result in practically freeing them from *Castnia licus*, although in localities near by the pest may be abundant; in such cases, however, the numbers can be kept down only by persistent effort year after year. The most important sugar-cane pests in British Guiana are the small moth borers

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(*Diatraea saccharalis* and *D. canella*), now more abundant than 25 years ago. The number of caterpillars and pupae collected by cutting out "dead hearts" was 15,285,960 in 1913, as compared with 13,632,655 in 1912. It is advised that collecting should be commenced at the earliest possible moment, in order to prevent, as far as possible, the complete development of the larvae of the first generation, thus largely eliminating the second and third. On five estates 281,181 eggs were collected. Attention is given to indirect aids to control, prominent among which are: (1) The production of healthy vigorous growing canes, and (2) the use of resistant varieties. To ensure healthy plants, selection of the very best tops only is admissible, and all operations of drainage, tillage, weeding, and manuring must be given careful attention also. The Bourbon cane best fulfils the second condition in British Guiana. Further suggestions are (1) that the trash should not be burnt, and (2) that there should be less ratooning. Termites come next to the small moth borer in point of severity of attack. The weevil borer (*Metamasius hemipterus*) was present on all estates, but abundant on only a few. Other insects, the occurrence of which is mentioned, are: The coconut palm weevil (*Rhynchophorus palmarum*; the hard-back beetles, *Dyscinetus bidentatus* and *Cyclocephala signata*; the shot-borer (*Xyleborus* sp.); the sugar-cane Aspidiotus(*Aspidiotus sacchari*); the pink mealy-bug (*Pseudococcus calceolariae*). A leaf-hopper and a frog-hopper (*Tomaspis* sp.) were observed in very small numbers. The cane-stool moth, the dead cane moth (*Monodes agrotina*) and several leaf-eating caterpillars, such as *Remigia repanda*, *Laphygma frugiperda* and *Lycophotia infecta* are also recorded.

Solanet (L. E.). **Déstruction simultanée du Négril et de la Cuscute des Luzernes.** [The simultaneous Destruction of *Colaspidema atra* and Lucerne dodder.]—*Montpellier*, n.d., 30 pp.

Experiments made during four consecutive years have shown that calcium cyanamide, reduced to the finest and lightest powder possible and applied annually at the rate of 90 lbs. per acre, is an efficacious remedy against both the beetle and the parasitic plant. It does not interfere in any way with the growth of the lucerne. In order to spread such a small quantity of cyanamide uniformly the author advises its admixture with other substances, and gives the following formula: Cyanamide, 1 part; gypsum, 2 parts; wood ashes, 1 part.

Gowdey (C. C.). **Report by the Entomologist of the Uganda Protectorate.**—*Annual Report of the Dept. of Agric. for the year ended* 31*st March, Kampala*, 1913, pp. 29-39.

Insects attacking Coffee. *Lecanium africanum*, Newst., was the most prevalent scale-insect during the year, attacking both vigorous and weak trees, the latter usually fatally. It is treated successfully with a solution of whale-oil soap at a strength of 1 lb. of soap to 5 gallons of water. Both *L. viride*, Green, and *L. africanum* are associated with a black fungus. *L. viride* restricts its attacks to the under surface of the eaves and to young shoots. This species has also proved susceptible to treatment with whale-oil soap. It is preyed on by the Coccinellid

beetle *Chilocorus discoideus*, Crotch, and parasitised by a Chalcid. *Stictococcus gowdeyi*, Newst., attacks the young shoots, and is rather difficult to kill without using insecticides at such strengths as to affect the foliage. A large percentage of *Pulvinaria psidii*, Mask., was parasitised. *Ceroplastes ceriferus*, And., in addition to coffee, attacks tea, *Anona muricata*, *Citrus* spp., *Ficus* spp., and *Antigonon*. The Mediterranean Fruit Fly (*Ceratitis capitata*, Wied.) in Uganda breeds throughout the year, some kind of food being always available. It has been bred from *Anona muricata*, banana, coffee berries, guava, lemon, orange, pine-apple and papaya. Of the crickets, *Gryllus bimaculatus*, de G., and *Gryllotalpa africana*, P. de B., the latter is the more destructive, particularly so in nurseries with heavy shading. The Coffee Beetle (*Stephanoderes Coffeae*, Haged) is reported to be causing less loss to coffee-growers.

Insects attacking Cacao.—The scale-insects (*Stictococcus dimorphus*, Newst.) were parasitised to a greater extent this year by the Noctuid moth, *Eublemma costimacula*, Saalm. Experiments showed that a spray of 20 per cent. solution of borax was most effective. Plant lice (*Aphis* sp.) have only been observed to attack cacao from about one to two-and-a-half years old, grown under heavy shade of bananas. They attack the undersides of the young terminal leaves and form a cabbage-like mass. They are always associated with an ant. This aphis is preyed on by the Mantids, *Sphodromantis lineola*, Burm., and *Pseudocreobotra wahlbergi*, Stål. The crickets (*Gryllotalpa africana*, P. de B., and *Gryllus bimaculatus*, de G.) are eaten by the natives, and hand-collecting has proved successful. The operation can be carried out most satisfactorily by providing hiding places in the nurseries, such as grass or pieces of banana leaves, under which the crickets will hide during the day, and can then be easily collected. The habits of the Cacao Fruit Fly (*Ceratitis punctata*, Wied.) are similar to those of the Mediterranean Fruit Fly. Ripe fruit is necessary for the eggs to hatch; if, therefore, the cacao pods are picked as soon as ripe the maggots will not be fully grown, thus reducing the number of the adults to infect the next crop. The Cacao Beetle (*Adoretus hirtellus*, Castn.) seriously injures young trees under about three years old. Sprays of arsenate of lead at the rate of 3 lb. to 50 gallons of water, and of chromate of lead at the rate of 2 oz. to 4 gallons of water are valuable insecticides, and withstand heavy rains.

Insects attacking Cotton.—The Cotton Stainers recorded are *Dysdercus nigrofasciatus*, Stål, *D. pretiosus*, Dist., *Oxycarenus gossypinus*, Dist., *O. hyalipennis*, Costa. No report was received of damage caused by Bollworm (*Earias insulana*, Boisd). Only isolated plants were attacked by scale-insects (*Pulvinaria jacksoni*, Newst.) Several specimens of the parasite, *Tetrastichus gowdeyi*, Crawf., were bred from this scale.

Insects attacking Tea.—A scale-insect (*Aspidiotus transparens*, Green) attacks the under surface of the older leaves and covers them. *Ceroplastes ceriferus*, And., has not been found to be a serious pest.

The report concludes with two tables showing a list of 25 species of ticks found in Uganda, together with their hosts and the diseases that they transmit.

ANDREWS (E. A.). **On Insects. Part II.**—*Ind. Tea Assoc., Scientific Dept., Quarterly Jl., Calcutta*, 1913, pt. 2, pp. 33-42.

In the course of this article the following formula is given for use in the nursery against grasshoppers suspected of injuring the young tea plants: Lead arsenate, 1 lb.; jaggery, 5 lb.; water, 100 gallons. Flooding the nursery for a short time, say half a day, appears to be a practical measure against crickets. Another method of dealing with them is by means of poisoned bait, Lefroy's formula being: Husks of rice, 80 lb.; white arsenic, 2 lb.; gur, 4 lb. When the young crickets first hatch, they stay in the burrow, but after a few days emerge and begin to feed, digging fresh burrows for themselves every night; as they grow older they dig deeper, and eventually adopt a permanent burrow. Crickets do great damage to the tea plants, cutting off the tops of the seedlings and dragging them to their burrows. They also do injury to jute, indigo, rice, and many other plants. Owls and bats consume large numbers of these pests, and heavy rains drive them out of their burrows; when this happens birds destroy great quantities of them. Digger wasps and ants are also to be reckoned amongst their enemies.

URICH (F. W.). **The Froghopper Egg-Parasite** (*Oligosita giraulti*, **Crawford) and its colonisation in the Cane Fields.**—*Bd. of Agric., Trinidad and Tobago, Port-of-Spain, Circ.* no. 11, 18th Aug. 1913, 9 pp.

The vermilion froghopper egg-parasite (*Oligosita giraulti*, Cwf.) has been bred from grass from various localities in Trinidad. From experiments it is found that the most suitable stage of the development of the froghopper egg for the parasite is that in which the embryo is well advanced, and that the larval and pupal stages of the parasite take from 22 to 41 days. The adult parasite is very active, and ever searching for froghopper eggs, passing from one piece of grass to another by little leaps. The multiplication of the parasite is by no means so great as that of the froghopper. However, the eggs of the latter require more moisture to hatch than the parasite requires for its development, so that this is a factor greatly to the advantage of the parasite. Another important factor is that the parasite reproduces parthenogenetically and a female is ready to lay one hour after issuing from a froghopper egg. Parasitism of froghopper eggs under normal conditions is probably about 25 per cent. Colonisation of the parasites in the cane-fields is thought to be best carried out by transferring grass yielding parasites by cartloads to fields harbouring no parasites.

KERSHAW (J. C.). **Froghoppers.**—*Bull. Dept. Agric., Trinidad and Tobago, Port-of-Spain*, xii, nos. 72 & 73, Aug. & Sept. 1913, pp. 3-12, 95-101, 3 pls.

The growth of the young sugar-cane could be hastened by a fertiliser and the plants would probably hold their own against the nymphs of the froghopper until grown too large to suffer much damage. Nitrolim, a valuable and fairly cheap fertiliser, which is also of some use in killing the nymphs, is therefore worth an extended trial. The planting of trees and shrubs on waste land adjoining cane fields would encourage the spread of the tick bird (*Crotophaga ani*) and other useful

birds. In Trinidad the cane fields seem deficient in the various native insects and spiders which prey on the adult froghopper, and the author suggests that in the middle of large fields a small plot of cane be left to provide a refuge and breeding place for them. Carbon bisulphide is unsatisfactory as an insecticide for froghopper nymphs under field conditions, as they are, as a rule, hermetically sealed on the rootlet with spittle, which the fumes can only penetrate with difficulty. To be effective, a very large quantity of the chemical would be necessary and the expense would be prohibitive. If trash is left as long as possible on the fields the parasites have a chance of hatching and escaping, and the author believes that if the trash is left lying about and not piled up, it is unfavourable rather than otherwise to the froghopper eggs. There are three artificial methods of control, apart from the Green Muscardine fungus, which promise some measure of success, and which are being tried on a large scale at Chaguanas:—(1) Using Nitrolim as a manure primarily, and secondarily against the froghopper nymphs; it is applied to the roots of the canes by the usual dusters. (2) Kerosene-Lysol emulsion against the adult froghopper. This is very effective if properly applied, as the insect is killed in a few minutes if touched at all by the liquid. Lysol (3 oz.) and kerosene (9 oz.) are mixed in the measure, and then stirred up in 4 gallons of soft water. This 2 per cent. emulsion remains emulsified indefinitely. Kerosene and water is even more effective, but unless continually shaken up will separate almost immediately, and is therefore unsafe for coolie use. When making the experiments an ordinary whisky bottle (27 oz.) was fitted with a cork through which passes a short piece of glass of ¼ inch bore, so that it emits a jet, not a spray. A little of the emulsion is shaken into the leaf sheaths where the insects are hiding. This is best done when the canes are small; when they are more than breast-high it will be far more difficult to apply the liquid. (3) After each brood of adult froghoppers, the old leaves on the growing canes should be examined for eggs, and if any numbers are found, the canes should be trashed and the trash taken at once to the cattle sheds for use as litter, when the eggs will soon be destroyed. If the sheds are unable to deal with all the trash at once, it should be stacked on bare ground away from vegetation until it can be used. On some estates it might be possible to spread it on a piece of waste ground and fold cattle temporarily upon it.

The author insists upon the importance of directing remedial measures especially against the first broods of the insect in the spring, but meanwhile (Aug. 1913) he advises the continued and extended use of trap lights for catching the adults, for the damage done to the cane by the sucking of large numbers of adults on the leaves is very great. It is supposed that a loss of 111 gallons of sap per acre is a very conservative estimate, as many of the factors used in the calculation were kept very low. Observations relating to the feeding of the adult froghopper show that in one hour's continuous sucking it voids about 0·75 c.c. of liquid excrement. There is now little doubt that the Syrphid larva, noted by Gough in 1910, is largely responsible for the diminished numbers of the third froghopper brood. During the larval stage each of them kills several froghopper nymphs, probably a dozen at least. This Syrphid will be found in all localities, wet or dry, where the froghopper exists.

Urich (F. W.). **The Sugar-cane Froghopper and Biological Notes on some Cercopids of Trinidad.** *Bull. Dept. Agric., Trinidad and Tobago, Port-of-Spain,* xii, no. 72, Jan.-Aug., 1913, pp. 12-34, 7 figs., 6 pls., 3 diagms.

This paper is a complete treatise on the Trinidad froghopper. Records of allied species in adjoining countries are given, and may be summarised as follows: In Mexico, *Tomaspis postica* has been a plague to the grass-lands of the State of Vera Cruz at least since 1880, and is now common in the sugar-cane plantations there. Froghoppers have been found on cane in British Guiana, but so far no damage is reported. In 1883 they appear to have caused some trouble in British Honduras. In Panama specimens of *Tomaspis lepidior* were collected on cane, and an undetermined species of *Tomaspis* was taken in Cuba, but the food-plant is not recorded. In Grenada and St. Vincent froghoppers have been recorded under the name of *T. pictipennis*. In Suriname *T. rubra* has been taken on *Eupatorium odoratum*, and *T. pubescens* is found on grass. An undescribed species of *Tomaspis* was found on grass on the Windward (north) side of Tobago.* The subjects next dealt with are the origin and distribution of the insect, food-plants, and damage done. These are followed by a complete life-history. The uncontrolled progeny of a single female during four wet months is estimated at 20,000 adults. Hence the necessity for doing control work early in the season. The conditions favourable to froghoppers are next mentioned, and it is stated that weeding, burial, or removal of trash, and planting of cover crops are valuable remedial measures. Burning the trash is a procedure which proves unsatisfactory. Seventeen enemies are given: Two birds, the Scissors-tail Flycatcher (*Milvulus tyrannus*) and the Merle Corbeau (*Crotophaga ani*); a ground lizard (*Ameiva surinamensis*); a toad (*Bufo marinus*); several species of Attidae or jumping spiders; a Mite (*Rhyncholophus* sp.); *Phlugis mantispa*; a Mexican Reduviid bug (*Castolus plagiaticollis*) and the Toad Bug (*Galgulidae*); several ants, *Anochetus inermis, Solenopsis geminata, Monomorium* sp.; two species of Chalcididae; a Syrphid fly (*Salpingogaster nigra*); a Nematode (*Mermis* sp.); and two fungi (*Metarrhizium anisopliae* and *Empusa* sp.). In connection with natural control, the author advises an active campaign against the mongoose, as it is the greatest enemy of the ground lizard, which he thinks is worth far more than birds, so far as the froghopper is concerned. Insecticides form the last subject mentioned, and it is said that several experiments against adults and nymphs were undertaken, but none proved effective.

Mention is made of the fact that besides *Tomaspis varia* the sugar-cane froghopper, there are three other species of the same genus occurring in Trinidad. Luckily none of them attack sugar-cane, but as they may be mistaken for *T. varia*, brief descriptions with figures are given of *T. rubra*, L., var. *sororia*, Germ., *T. pubescens*, F., and *T. guppyi*, sp., n.

* [Since described as *T. carmodyi*, Kershaw.—Ed.].

VASSILIEV (Eug. M.). **Появленіе болѣе значительныхъ количествъ лугового мотылька и личинокъ свекловичной щитоноски.** [The appearance of *Phlyctaenodes sticticalis*, L., in increasing numbers, and also of the larvae of *Cassida nebulosa*, L.]—**Труды Опытной Энтомологической Станціи Всероссійскаго Общества Сахарозаводчиковъ за 1912 г.** [*Studies from the Expt. Entom. Sta. of the All-Russian Soc. of Sugar-Refiners for* 1912.] *Kiev*, 1913, pp. 31-45, 5 figs.

The author deals with his observations on the habits of *Phlyctaenodes sticticalis*. In order to prevent the females from ovipositing on the plantations, fumigation by means of smouldering dung, mixed with sulphur, was applied with a certain degree of success. The insects were also caught in fermenting molasses, but it was found out that they are not attracted by molasses in the same way as *Agrotis* and *Mamestra*. Oviposition started in the Governments of Charkov and Kiev in the middle of June, and took place chiefly on weeds, and less frequently on the leaves of sugar-beet, both on fresh and dry leaves. The author pays special attention to the plants which serve as food for these polyphagous insects, and he gives a long list of them arranged according to the system of Professor Vettstein, of Vienna. From this he deduces that these pests, belonging to one of the oldest families (Pyralidae) select their food mostly from the oldest orders of plants—Fagales and Urticales—and those orders which originated from them; most of the plants attacked belonging to the families Chenopodiaceae and Papilionaceae.

A Sphegid wasp, *Ceratocolus alatus*, Pz., has been observed to destroy the moths of *P. sticticalis* by paralysing them and storing them as food for their larvae; the cocoons of these wasps are more or less composed of the wings of *Phlyctaenodes*. Other species of this genus also prey upon Pyralid and Tortricid moths.

The author points out that it is not sufficient to mow down weeds round the plantations or on fallow land, but that in order to destroy the eggs effectively it is necessary either to spray the weeds before mowing with a 5-6 per cent. solution of barium chloride or with a 5-10 per cent. solution of iron sulphate, or to burn the mowed grass, having poured some kerosene over it.

The females do not oviposit on the plants on which they feed, but always fly for this purpose to fallow fields, where they lay their eggs mostly on *Atriplex*, an average of 26 eggs being found on one plant, this number rising to 60 in some cases.

VASSILIEV (Eug. M.). **Кормныя растенія нѣкоторыхъ растительноядныхъ насѣкомыхъ и причины, обусловливающія ихъ выборъ.** [Plants serving as food for some herbivorous insects and the causes of their selection.]—**Труды Опытной Энтомологической Станціи Всероссійскаго Общества Сахарозаводчиковъ за 1912 г.** [*Studies from the Expt. Entom. Sta. of the All-Russian Soc. of Sugar-Refiners for* 1912.] *Kiev*, 1913, pp. 63-66.

The author refers briefly and in a general way to the relation between insects and their special food-plants, a matter which, notwithstanding its great importance, has been very little studied. A typical instance

of a monophagous insect is provided by the *Phylloxera* of the vine, while there is not a single monophagous insect amongst the pests of sugar-beet. The author deals specially with *Bothynoderes punctiventris*, Germ., which, although polyphagous, discriminates in selecting its food. It feeds on plants of the order Chenopodiacae and on one plant of the order Polygonaceae. Of plants of the former order, it feeds on *Chenopodium album*, L., *Atriplex laciniatum*, L., *Salcola*, *Beta vulgaris*, L., and, according to some statements, on *Blitum*; of the second order, it feeds on *Polygonum aviculare*, L. The statements of some authors that they have observed this insect feeding on *Nicotiana* (Solanaceae) and *Cucumis melo*, L. (Cucurbitaceae) cannot be accepted as definitely correct without further observations; the author's experiments have satisfied him that it does not feed on plants of the orders Compositae and Papilionaceae. The two orders which serve as food for this weevil are considered to be genetically related, the Polygonaceae being the older and the Chenopodiaceae having probably been derived from them. The author assumes that *Bothynoderes punctiventris* originated at a time when the connection between these groups was closer, *i.e.*, when there were more intermediate forms between them than at present, and that it fed previously on some species of Polygonaceae, but later adapted itself definitely to the Chenopodiaceae. As to the causes determining the selection of plants, they evidently depend on the physical and chemical qualities of the latter. The author refers to the paper by Verschaffelt, "The causes determining the selection of food in some herbivorous insects." (Kon. Akad. Wetensk. Amsterdam, 1910, pp. 546-542), and suggests that perhaps the results obtained by this author may be utilised in applied entomology for the compounding of sprays for the protection of plants.

[Compare also the paper by Dr. I. Trägårdh noticed in this *Review* Ser. B, i, p. 223.]

LEVANDOVSKY (Revd. J.). **Пауки—враги пчелъ.** [Spider enemies of bees.] **«Русскій Пчеловодный Листокъ.»** [*Russian Bee-Keepers' Gazette.*] *Moscow*, Nov. 1913, pp. 378-387.

The author has paid special attention to this subject, and gives a list of the spiders which kill bees, together with an account of his own observations. The spiders mentioned belong to three families. THOMISIDAE: *Thomisus onustus*, Walck., (*T. albus*, Gmel.), *Misumena vatia*, Cl. (*Thomisus citraeus*, Walck.) and *Misumena tricuspidata*, F. Another genus of this family of spiders, *Xysticus*, is beneficial, as it destroys the spiders of the two former genera. The author describes his observations on one specimen of *Thomisus citraeus*, which settled down on a *Chrysanthemum corymbosum*, L., growing near to a bush of *Hesperis matronalis*, L., from which the bees kept gathering, and sometimes sat down on the former plant to clean themselves; the spider destroyed five bees in six days, perishing itself afterwards from attack by *Pelopaeus pensilis*; the sucking of the victim continued for about 24 hours. The author calculates that on this basis, 100 spiders are able to destroy 10,000 bees during four months of the honey season.

The second family is EPEIRIDAE, the following species being known to be injurious: *Epeira diadema*, Clerck, *E. angulata*, Cl., *E. cornuta*,

Cl., *E. patagiata*, Cl., *E. selopetaria*, Cl., *Tetragnatha extensa*, L., and *Miranda acalypha*, Walck., the last species having been observed to attack bees only this year. Of the third family, AGELENIDAE, only *Tegenaria atrica*, C.K., is known to the author to prey on bees.

UVAROV (B.). **Отравленныя приманки въ борьбѣ съ саранчевыми.** [Poisoned baits in fighting locusts.]—Reprint from **«Южно-Русская С.-Х. Газета».** ["*South Russian Agric. Gazette*,"] *Stavropol Entomological Bureau, Charkov*, 1913, 11 pp.

The author refers first to some objections raised against the use of "chemical remedies" (spraying) against locusts on the ground that *Stauronotus maroccanus* often lays its eggs in deserts, bare of any plants, thus making it impossible to poison them by spraying, as there are no plants. He is of opinion that locusts very seldom oviposit in deserts, but usually keep near pastures or cultivated land, flying away only short distances to deposit their eggs in steppes; even these steppes provide some food for the hatched larvae in the form of scattered bush plants, which can be sprayed and poisoned, although he admits that in these cases there will be some waste of insecticides. As to places quite destitute of any plants, evidently the larvae must feed there on something, as otherwise they would starve wholesale, and such cases have not been reported up till now. The larvae in such places feed on various foods, horse-dung for instance, which they would not touch under ordinary conditions. Therefore, he suggests the application of chemical methods in those places by providing food and poisoning it, and quotes a work of D. Morosov, published in 1903, who reports the successful use of various poisoned foods, consisting either of lucerne or other leaves, horse-dung, or bran, imported into such places for that purpose. He refers to the present use of poisoned bait in America, South Africa, and Australia, and reports briefly on the results obtained by this means in the Government of Stavropol during the campaign against locusts in 1913. To make the food more attractive, the lowest and cheapest grades of molasses were added to the bait. A full report on these experiments will be given later.

KURDJUMOV (N. V.). **Птеромалиды, паразитирующіе на гессенской мушкѣ съ описаніемъ двухъ новыхъ видовъ.** [Pteromalid parasites of Hessian fly (*Mayetiola destructor*, Say) with a description of two new species.]—Reprint from **«Энтомологическій Вѣстникъ»** ["*Entomological Herald*"], *Kiev*, ii, no. 1, 1913, 4 pp.

Pteromalids are chief amongst the parasites of the pupae of the Hessian fly, but most of the species have not been sufficiently studied. The following have been recorded in Europe:—*Merisus intermedius*, Lind., *M. destructor*, Say, *Micromelus subapterus*, Riley, *M. rufomaculatus*, Walk., and *Holcaeus cecidomyiae*, Ashm. In Russia the following species have been reared:—*Merisus intermedius*, Lind., *Micromelus rufomaculatus*, Walk., *M. subapterus*, Riley, *Eupteromalus arvensis*, sp. nov., and *Meraporus crassicornis*, sp. nov. The author is of opinion that *M. intermedius* is a synonym of *M. destructor*, and that *M. subapterus* is a synonym of *M. pyrrhogaster*, Walk., the latter in its turn being only a wingless or semi-winged variety of

M. rufomaculatus, Walk. The last-named species has always been found by the author as a hyperparasite, and he is satisfied that PTEROMALIDAE usually attack the host when it has already passed into the pupal stage. They frequently appear to be hyperparasites breeding on *Polygnotus minutus*, Lind. A descriptive table of the various species of PTEROMALIDAE is given, and the two new species are described in English. *Eupteromalus arvensis* is a common parasite of Hessian fly in Poltava, Moscow and Kiev, while two females of *Meraporus crassicornis* have been reared from cocoons of the host in Poltava in 1910, and nine in Kiev.

Tasmanian Insects Pests.—*Report of the Tasmania Agricultural and Stock Department for* 1912-13, *Hobart*, 15th July 1913, p. 9.

The Director of Agriculture of Tasmania reports that there have been no serious outbreaks of codling moth amongst fruit trees, and the slight outbreak of San José scale in the city of Launceston has been so successfully dealt with that not an insect, dead or alive, was found. The trees received two good winter sprayings with lime and sulphur wash, and every tree on which the live scale was found in summer was also treated then with the sulphide of soda spray. The work was carried out thoroughly, and many gardens in which the scale was found last year and which were treated are now perfectly clean.

METCALF (C. L.). **The Syrphidae of Ohio.**—*Ohio Biological Survey, Bull.* 1, *Ohio State University, Columbus, Ohio*, xvii, no. 31, June 1913, 122 pp., 3 figs., 11 pls.

This is the initial bulletin of the Biological Survey of Ohio, the object of which is to secure accurate and detailed information as to the occurrence, distribution, and ecology of the animals and plants of Ohio. The bulletins will be published at irregular intervals, as the investigations are completed. This volume is divided into three parts. The first covers the following headings: General discussion of the family; general characters; an evolutionary table of larval habits; biological and ecological relations and economic importance of the larvae; ecological relations and economic importance of the adults; enemies and practical measures. The common milkweed (*Asclepias* sp.) is a rather formidable enemy of the adult SYRPHIDAE, as their legs are caught by the pollinia of this plant; thus large numbers of the weaker-bodied flies are entrapped. The parasitic insects of the family ICHNEUMONIDAE are also serious enemies of SYRPHIDAE, at least of the Aphidophagous species. At times fully 75 per cent. of the individuals collected were destroyed by these parasites. Minute Chalcid parasites also prey upon the larvae of *Baccha babista*. Something might be done towards increasing the number of these valuable insects if people could be brought to see that SYRPHIDAE, both as larvae and adults, are among our most valuable friends. Part 2 contains a key to known larvae and pupae of SYRPHIDAE, synopses of life-history studies, and a review of the literature on the biology of the family. Finally, Part 3 gives a key to the genera, a list of Ohio species and a brief bibliography.

FLETCHER (T. B.). **Note on Insects Attacking the Paddy Plant in Southern India.** *Madras Dept. Agric. Bull., Madras*, iii, no. 67, 8th Apr. 1913, 10 pp., 10 figs., 2 pls.

ORTHOPTERA: *Hieroglyphus banian*, F., occurs in all rice-growing tracts throughout the plains of Southern India. The eggs are laid in masses in the ground, usually between October and December, the young emerge about June, and become mature in about 70 days in the case of males, or 80 days in the case of females. This insect feeds on paddy, sugar-cane and maize, but chiefly on paddy, of which it is a major pest, doing serious damage, both in the adult and hopper stages. The best remedial measure seems to be the catching in small bag-nets of the young hoppers soon after they have hatched out. *Oxya velox*, F., is a smaller grasshopper than *H. banian*, and its life-history is not known in detail. It feeds on paddy, cholam, sugar-cane, etc., and is usually a minor pest of paddy. It is often found in company with *H. banian*, and may be controlled in the same manner by sweeping in bag-nets. The adult grasshopper is sometimes attracted to lights at night, and trial of light-traps is indicated in cases where damage is being done.

COLEOPTERA: *Epicauta* sp. This is a small Cantharid beetle, found as a local pest of paddy in South Kanara in October, eating the flowers and also attacking ripe ear-heads. The life-history is not known. Collection of the beetles by hand or in small hand-nets is indicated as a means of control. The Galerucid beetle, *Oides affinis*, Jac., has been found at Shoranur (Malabar), in July and August. Its status as a pest is doubtful, at most it seems sporadic and local. *Leptispa pygmaea*, Baly, a minute Hispid beetle is found chiefly in South Kanara, Malabar, Mysore and Cochin, usually in July and August. The eggs are laid on paddy leaves, and the grubs feed on their upper surface, the attacked leaves usually folding over and hiding the enclosed grub, which, when full-fed, pupates on the leaf, the beetle emerging after about four days. The beetles also eat the leaves, although to a less extent than the grubs. This insect may be a serious pest, and is said to be worst in wet weather. No successful remedy has been devised so far, but bagging by hand-nets may be tried. *Hispa armigera*, Oliv. (*aenescens*, Baly), occurs in all the rice-growing tracts of Southern India, and becomes sporadically a serious pest of paddy. The eggs are laid on the leaves, in which the grubs tunnel, producing discoloured patches, and ultimately pupate in the leaf. No satisfactory remedy has been found so far, but catching the beetles in nets is suggested. *Calandra oryzae*, L., the rice-weevil, can scarcely be considered a pest of paddy, although occasionally found in the field on ripe ear-heads, but it is a serious pest of stored rice.

LEPIDOPTERA:—*Melanitis ismene*, Cram., is found throughout Southern India, occurring from sea-level to elevations above 7,000 feet. The pale green caterpillar feeds chiefly at night and sometimes attacks paddy, but as a rule does very little damage. *Parnara mathias*, F., the rice-skipper, occurs throughout the plains of Southern India, but is a minor pest of paddy, as a rule, its numbers being kept in check by various parasites and predators. The caterpillar lives in leaves rolled longitudinally. *P. colaca*, Moore, has been found on paddy at Saidapet and Madras, but is not a regular pest. Another

skipper, *Telicota augias*, L., is a minor pest of sugar-cane, but is stated to feed on bamboo and paddy. It has not been noted as doing any real damage. *Cirphis unipuncta*, Haw., the army-worm, occurs throughout Southern India, chiefly in October and November. The caterpillar is a minor pest of cholam, occasionally attacking paddy, maize, etc. Protection of cultivated tracts by digging narrow steep-sided trenches around them is usually the only practical measure to prevent attack when the caterpillars are swarming. *Spodoptera mauritia*, Boisd., occurs throughout Southern India, and the caterpillar sometimes does considerable damage to seedling rice-plants. The eggs are laid usually on the under-surface of blades of grass or paddy, in batches covered by buff-coloured hairs from the female moth. The caterpillar feeds at night, and when full-fed pupates in the soil, the moth emerging after about ten days. In the case of small areas, such as seed-beds, the following control measures may be adopted: (1) Protection of seed-beds by surrounding them with narrow steep-sided trenches; (2) collection of egg masses; (3) spraying; and (4) flooding of area and turning in ducks. This last method is used successfully in some districts. *Sesamia inferens*, Wlk., occurs throughout Southern India, the caterpillar being a bad pest of ragi, and often found as a minor pest of maize, cholam, paddy, wheat and sugar-cane. The caterpillar bores inside the stem, pupating in the larval burrow. The attacked plants show dry ears, and destruction of these is indicated to prevent extension of the attack. *Remigia frugalis*, F., is occasionally a very minor pest of paddy throughout Southern India. The caterpillar feeds exposed on leaf blades. *Psalis (Dasychira) securis*, Hb., is a minor pest of paddy throughout the plains of Southern India. Pupation usually occurs on a leaf-blade in a cocoon formed of silk, interwoven with larval hairs; the pupal period is about ten days. The caterpillars are conspicuous and feed exposed, and are therefore easily collected by hand. *Ancylolomia chrysographella*, Kollar, is found throughout Southern India, the caterpillar feeding on paddy, *Paspalum dilatatum*, and probably on all grasses. It has only been found on one occasion as a serious pest of paddy seedlings, but is liable to occur at any time in dry sandy localities. The pale green caterpillar feeds at night, remaining during the day in long tubular galleries lined with silk at the roots of its food-plant. Pupation occurs in the larval gallery; the pupal period is about ten days. Control measures include (1) flooding of affected areas to bring up the caterpillars, which are greedily devoured by crows, etc.; (2) spraying of plants (in small experimental areas, seed-beds, etc.); and (3) attraction of moths by means of light-traps at night. *Schoenobius bipunctifer*, Wlk., the paddy stem-borer, occurs throughout the plains of Southern India as a very serious pest. The eggs are laid on leaves in clusters, covered with yellowish hair. The caterpillar bores into the stems of the paddy and pupation occurs in the larval burrow, which is lined with silk. The moth emerges through a hole previously cut by the caterpillar through the side of the stem. No really successful control-measure can be given as yet, but to reduce the damage the following means are suggested: (1) Ploughing and, if possible, burning of paddy-stubble after the harvest is gathered; (2) collection of egg-masses, which are conspicuous; and (3) attraction of moths to light-traps at night. *Nymphula depunctalis*, Gn., is a serious pest of paddy

throughout Southern India. The caterpillar is semi-aquatic, living in cases made of rolled pieces of leaf, and is furnished with bunches of slender filamentous gills along the sides. It crawls up the plant above water-level and feeds on the green tissues of the leaf. Pupation occurs in the larval case. Draining the water off the affected fields is indicated as a remedy, but this is rarely possible in practice, as this pest is chiefly found in low-lying, water-logged areas. In some districts, a thorny bush is dragged over the field to dislodge the larval cases, and the water is then drained off; it is, however, difficult to see what is the value of the thorny bush, and the draining of the water is evidently the important factor where success is claimed for this method. *Cnaphalocrocis medinalis*, Gn., occurs throughout Southern India, and is a minor pest of paddy as a rule, occasionally doing considerable damage in the Northern Circars. It is not known as a pest in the southern parts of Madras. The caterpillar lives inside folded leaves, of which the tip is fastened over the broader basal part; it eats the leaf tissue so that the leaves become whitened and sickly. No remedial measures, applicable on field scale, can be suggested at present.

THYSANOPTERA:—Various species of Thrips occur on paddy, but they have not been worked out.

RHYNCHOTA:—*Menida histrio*, F., is found throughout Southern India as a minor pest of paddy; also on wheat, cholam and pulses. Collection by hand-nets is indicated in the case of small areas. *Tetroda histeroides*, F., has been found at Salem and Coimbatore as an occasional minor pest of paddy. Collection by hand and by hand-nets is suggested on small areas. *Leptocorisa varicornis*, F., the rice-bug, occurs throughout Southern India as a serious pest of paddy, especially on the West Coast. The eggs are laid in rows on leaves of paddy and grasses. The bugs especially attack the ripening grain, sucking the milky juice, so that the ears turn wholly or partly white, no grain being matured. Collection in hand-nets has been found the most efficient method of control. *Tettigoniella spectra*, Dist., a small white Jassid, occurs throughout Southern India in paddy fields. It has not actually been noted to be a pest, but may at times do some damage. The adults are strongly attracted to light at night, and this fact may be utilised as one means of control. *Nephotettix bipunctatus*, F., occurs on paddy on the plains of Southern India; it is probably a minor pest. The adults also fly freely to light.

Thrips and Cacao Beetles.—*Bull. Dept. Agric., Trinidad and Tobago*, xii, no. 72, Aug. 1913, pp. 66-70, No. 74, Oct. 1913, p. 136.

Mr. Rorer furnishes the following report on the cost of spraying cacao. Against Thrips it is necessary to spray both leaves and pods, and the figures given are for this method. A barrel outfit, costing about £10, or a set of compressed air knapsack-sprayers, costing about £20, will, under favourable conditions, spray about 500 trees a day; so if it is necessary to spray 1,000 a day, from £20 to £40 must be invested in apparatus. One man should spray at least 75 trees a day, or 100 if they are small, and if facilities for spraying are good, so that 15 men should be well able to cover 1,000 trees a day. The cost of the spray mixture itself depends on the materials and quantity used. Bordeaux

mixture costs about £1 13s. per 1,000 gallons, or £3 6s. if 80 lb. of arsenate of lead are added. One per cent. lysol costs about £2 per 1,000 gallons, and nicotin sulphate solution about the same. Kerosene emulsion is still more expensive. On the average, three-quarters of a gallon of spray mixture is required per tree, so that 1,000 gallons will cover 1,300 trees. These figures work out approximately at a maximum of £3 per 1,000 trees per application. Spraying with Bordeaux mixture alone is much cheaper than this. All things considered, the cost per 1,000 trees would be about £2. This can be reduced by one-half or two-thirds if the fruit alone is sprayed. The cacao spraying experiments were showing up well this year: not only were the sprayed trees yielding better, but there was very little black cacao, while in unsprayed places the percentage of black cacao was very high.

Mr. Urich has noticed that when a certain insecticide turned out to be good, and a demand was made on it, it generally gave out, and much time elapsed before more could be had, even if telegraphed for. That especially applied to lysol. A search is being made for natural enemies of the cacao Thrips, and one may be found in Trinidad or some other island. Later on, Mr. Urich reports a decrease of the insects, but recommends a careful watch for their appearance on the pods. As soon as this takes place the pods should be sprayed. Thrips yield to good cultural methods very easily.

The ravages of the cacao beetle (*Stirastoma depressum*) are quite as bad, if not worse, than those of Thrips. Energetic application of trapping, and spraying with arsenate of lead is recommended. Arsenate of lead can also be very well applied to small trees with a good-sized paint-brush.

At the September meeting of the Board of Agriculture, Mr. Urich stated that he observed but few Thrips on his recent visits to the districts of Sangre, Grande, and Caparo, nor had he any reports of their prevalence in numbers in other places. The rains appeared to be keeping them in abeyance.

Adult cacao beetles were just appearing, and it would be well to collect and trap them before they had time to lay eggs. In places where Thrips or cacao beetles are known to be troublesome, spraying should be carried out during October. For Thrips it is recommended to use Bordeaux mixture and lysol in the proportion of one to two gallons of lysol to every 100 gallons of mixture. For cacao beetles Bordeaux mixture with 4 to 8 lb. of arsenate of lead to every 100 gallons of mixture should be used.

Rorer (J. B.). **The Green Muscardine Fungus.**—*Bull. Dept. Agric., Trinidad and Tobago, Port of Spain*, Sept. 1913, xii, no. 73, p. 105.

A point of great economic importance is that infections with the disease can be brought about as early in the season as the froghopper appears. The author saw dead froghoppers of the first brood covered with the fungus two weeks after the spores were applied, and this was much earlier than he ever observed natural infection taking place. He mentions that a few fungus cultivating cabinets have been constructed in Porto Rico, where certain beetles which attack sugar-cane

are found to be killed by this fungus. This is also the case in Illinois, where it is used to combat an insect pest of Indian corn. In Illinois a trial is being made of burying the fungus in the soil.

Two Useful Spray Fluids.—*Ind. Tea Assoc. Scientific Dept. Quarterly Jl., Calcutta*, 1913, pt. 3, pp. 79-84.

Bordeaux mixture attains its maximum efficiency when the copper sulphate and lime (calcium hydrate) are mixed in the exact proportions necessary to form copper hydrate. Any excess of either constituent impairs the activity of the mixture, and loss of efficiency means loss of money. A properly made mixture may be much more efficient than a carelessly made one containing double the percentage of materials. Besides being the best general fungicide, it improves the health of the plant, and it has been proved that its use on leaves and fruit intended for human consumption is in no way detrimental to the consumer. The following quotation from the eighth report of the Woburn Experimental Fruit Farm (1908) explains very clearly the best method of making this mixture at present invented:—

"One hundred gallons of such mixture is prepared as follows:—Dissolve 6 lb. 6½ oz. of crystallised copper sulphate by suspending it in a piece of sacking in two or three gals. of water in a wooden or earthenware vessel. Take about 3 lb. of good quicklime and slake it in a little water, then put it into a tub with 120 gals. of soft water. Stir the lime and water, then leave it to settle until the liquid is quite clear. Run off 86 gals. of the clear lime-water and mix it with the copper sulphate. Make up to 100 gallons with soft water. However the Bordeaux mixture is made, it is important to make sure that all the copper is thrown down. The most certain test that fruit-growers can use is to put a few drops of a solution of potassium ferrocyanide into a white saucer with some water, and to drop into this some of the clear liquid after the Bordeaux mixture has settled. A red or brown colour shows that there is copper in solution, and more lime water must be added until the test shows no coloration."

Originally used as a sheep-dip, lime-sulphur has been proved to be one of the best fluids for winter application to dormant trees, both as a fungicide and as an insecticide, and it has the additional advantage of stimulating the growth of the plant. The lime used should be the best commercial quicklime (stone or lump stone); air-slacked lime is useless. It is most undesirable that more than five per cent. of magnesium oxide be present. To test the amount of impurity in quicklime, the following simple method is useful. The apparatus required consists of (1) a glass cylinder about 2½ inches in diameter and 15 inches high, which should be graduated in cubic centimetres, and (2) a boiling vessel to hold about three pints. A quart of water should be poured into the vessel, and the level at which it stands should be marked on a piece of stick held vertically; then pour out the water. Weigh out carefully 2 oz. of the lime to be tested, place in the vessel and slake with water, adding the water gradually, not covering up the lime with it until the slaking is complete. Then stir the slaked lime into a paste with more water, continuing to add water until the level marked on the stick is reached, and then boil. Weigh 4 oz. of flowers of sulphur and stir vigorously into the boiling lime-water.

Boil gently for one hour, filling up to the mark with more water every ten minutes, stir quickly and pour into the glass cylinder. Allow it to stand overnight, and then measure the amount of the sediment in cubic centimetres. In the following figures, given by the author, the first represents the number of cubic centimetres of sediment, the second the appoximate percentage of impurity, the third the weight of the lime used, necessary to replace effectively 36 lb. of pure lime: 30—5 per cent.—38; 50—10 per cent.—40; 70—15 per cent.—42; 90—20 per cent.—45; 105—25 per cent.—48; 120—30 per cent.—51. The standard formula given is: best commercial quicklime, 36 lbs. finely divided sulphur, 80 lbs.; water, 80 gallons. It is unwise to use lime containing more than 10 per cent. impurities, as the sediment clogs the spraying machines.

Another Cockroach Poison.—*Agric. News, Barbados*, 27th Sept. 1913, p. 314.

Under the heading Insect Notes, there is given a formula recently tried in Barbados with apparently very good results. It contains naphthalene and boric acid in equal parts, the naphthalene being finely powdered before being mixed with the boric acid. This mixture has been sprinkled plentifully in the haunts and hiding places of cockroaches at intervals of about two weeks, and after two or three applications the insects almost entirely disappeared.

The following abstracts are taken from the monthly journal **«Туркестанское Сельское Хозяйство»**—[*Agriculture of Turkestan*], published at Tashkent.

Notes on Insect pests. *Agriculture of Turkestan*, no. 6, June 1913, pp. 585-590.

An editorial note deals with the multiplication of *Stauronotus maroccanus* in the province. This pest has all but disappeared since the campaign of 1911, and no damage by it was reported during the last three summers. Gradually, however, the broods of the remaining locusts—it is impossible to destroy all the insects without a single one being left—have increased, and in 1912 although no swarms were noticed, their egg-clusters were found in various localities. In the province of Samarkand it was necessary again to organise a campaign against them in some places, and their egg-clusters were also discovered in the district of Tashkent, which will necessitate renewed efforts in fighting them next year.

In South Eastern Bokhara the record in 1912 proved the existence of egg-clusters over an area of 274 square miles, and £32,500 was assigned to fight them. The use of the new insecticide, sodium arsenate, gave excellent results; portable iron sheets were also very useful. A field telephone was also brought into use for the first time, and greatly facilitated the communications between the separate parties. The insects are reported to have been destroyed by *Pastor roseus* (Rose Starlings). No migrations of the pests from Afghanistan were noticed this year, owing firstly to the gradual decrease in their numbers in that country, and to the fact that this year they flew to the south, in

the direction of Kabul; thus the campaign ended with great success. No damage to crops was done, and only small numbers of locusts remained, as in Turkestan in 1911.

Calopteuus italicus appeared in many parts of Turkestan, and also in great numbers in the streets of Tashkent. Some damage to wheat crops was done by this pest near the river Kashka-Darya, and observations have shown that about 80 egg-clusters were laid on one square foot. Serious damage to crops was also done by this locust in company with *Arcyptera truchmana* in the settlement Novo-Mikhailovsk, situated on the left bank of the river Tchirick. Another note relates to migatory locusts (*Locusta migratoria*), which hatched in 1912 in great numbers in their usual breeding places, the districts of Perovsk and Kazalinsk and the delta of the Amu-Darya. Notwithstanding the great numbers of egg-clusters there was no outbreak of these locusts in the district of Perovsk, owing to the overflow of the Syr-Darya during this spring when the clusters evidently were destroyed. According to statements from competent sources, it is hardly possible to fight this insect in these parts of the country, owing to local conditions, and usually no remedies are applied.

According to a statement by M. M. Siazov, *Epicauta erythrocephala*, which is very useful, as its larvae destroy egg-clusters of locusts, has done some damage to crops in the current year (1913), as well as last year. Potatoes and clover seem to have suffered most.

It appears that very few pests of field crops have been noticed this year, and neither the larvae of *Caradrina* nor those of *Hylietus*, which injure cotton seeds and tomatoes, occurred in quantities worth mentioning, except on one estate where the last-named pest appeared, but was successfully destroyed. Pests of orchards were very active, and *Cydia pomonella*, *C. funebrana*, *Rhynchites auratus*, *Pollyphylla adspersa*, various plant lice, etc., did much damage as usual.

SMIRNOV (D.). **Борьба съ персиковой тлею, термитами и муравьями при помощи карболинеума.** [The fight against *Lachnus persicae*, Chol., termites and ants by means of carbolineum.]—*Agriculture of Turkestan*, no. 8, August 1913, pp. 783-786.

The author records his attempt to control *Lachnus persicae*, an aphis which does great injury to peaches in the Murgab estates, by smearing carbolineum over the trunks and over the larger injured branches of the trees. This was done in December, and in the case of ten trees the smearing was applied too thickly, so that the author was obliged to wash a part of it away with kerosene; the further development of the trees was not satisfactory, and out of 16 smeared trees only 11 recovered, four recovered only partly, and one died. The author explains these unfavourable results as being due to the carbolineum having passed through the bark into the cambium, plugging the vessels. He is of opinion that the smearing ought to be done during the vegetative period in March and April and during wet weather.

He further reports excellent results obtained by him in his house by using carbolineum against termites and ants (*Hodotermes turkestanicus*, Jacobs, and *Camponotus maculatus turkestanicus*, Em.).

These insects evidently cannot stand the smell of carbolineum, and by smearing it over the wooden parts of the buildings, especially in places where the exits of the insects are situated, he was able practically to free his house from them.

An editorial note to this article calls attention to the fact that in the author's experiment with carbolineum on peach trees he brought in accidentally another material—kerosene—and it is not proved which of the two was injurious to the trees. [See this *Review*, Ser. A. ii, p. 6.]

Parasites of *Chloridea* and the Codling Moth.—*Agriculture of Turkestan*, no. 8, August 1913, pp. 810-813.

An editorial note deals with a parasite of tomato-worms, under which name the caterpillars of *Chloridea* are popularly known in Turkestan. Near Tashkent tomatoes were seriously damaged during last year (1913) by two species of *Chloridea*, *C. obsoleta* and *C. dipsacea*; there was also a caterpillar of a third species which remained unidentified. These caterpillars are very injurious, feeding day and night on the fruit. S. N. Bogoljubov, from the Entomological Station, has been studying these insects, and found a parasite of them. The name of the latter is not given, but a description of it is supplied; the females kill the caterpillars with their ovipositor, feeding on their blood and depositing eggs on the killed insect. The parasites prefer the blood of fresh victims and pass from one caterpillar to another. In the laboratory some females have killed as many as eight caterpillars during their life and deposited on them about 100 eggs. The development of the parasite from egg to imago lasts eight to fifteen days, thus a large number of generations is bred during one summer. Males of this parasite were also noticed. It is suggested to assist the breeding of these parasites by keeping the dead caterpillars, found near tomato bushes in a box with a wire-netting lid, so as to enable the hatched parasites to escape; such a box should be put in a tomato field on a sheet of glass or other support, protected by varnish from ants. A more detailed report is expected from Bogoljubov after the conclusion of his observations.

Another note relates to the parasite of the egg of *C. pomonella*, imported in 1911 by Radetzky from Astrachan [*Trichogramma semblidis*.] Last year (1913) they were found by Troitzky in many orchards of Tashkent, besides those in which they were released in the preceding years. In 1912, Plotnikov found these parasites in Ferghana, where no imported specimens were released. In 1913, they were found in the districts of Samarkand and Ferghana. Whereas the parasites in Tashkent are exclusively parthenogenetic females, in Ferghana both sexes are found, and the parasites hatch from fecundated eggs; the parasites in Samarkand, where also both males and females are found, differ in colour.

It is reported that in the garden of the governor of Ferghana, where enormous quantities of these parasites were found, and where in the first half of July all the eggs of *C. pomonella* were infested by them, there were also found large quantities of caterpillars of the codling moth. The information obtained will decide the question as to whether the imported parasites have been able to acclimatise themselves in Turkestan or whether there are local representatives of them.

MIROSHNITCHENKO (A.). **Истребленіе шершней и осъ на пасѣкахъ и виноградникахъ.** [Destruction of hornets and wasps in bee-hives and vineyards.]—*Agriculture of Turkestan*, no. 9, September 1913, pp. 931-934.

The author suggests a new method of destroying wasp-nests, which he has applied with success. He used a soldering lamp, which gave a flame of about 5½ inches long. By directing the flame into the nest, it was possible to remove the latter, and also to destroy it, by burning it with the same lamp, without being subjected to stings from the insects; the strong glare keeping the wasps back and not allowing them either to protect themselves or to escape. The author has destroyed in this way 111 nests of wasps without being stung.

It appears from the author's remarks that wasps are a most serious pest in that country and, according to statements of persons knowing South European Russia and the Crimea, there is no place where wasps are so abundant as in Turkestan.

PLOTNIKOV (V.). *Pachydissus* **attacking Poplars.**—*Agriculture of Turkestan*, no. 10, October 1913, pp. 1038-1040.

In reply to a correspondent who sent in an insect pest which has done great damage to poplars and other trees in Kokanda, the author identified the species as *Pachydissus sartus*, Sols., and gives information as to its habits. As a remedy he suggests cutting out and burning the damaged trees; the remaining trees must be kept in a healthy state, and any parts of them damaged from other causes must be smeared over with carbolineum, tar or pitch, adding creosote or carbolic acid.

DERIABIN (P.). **Личинки щелкуна, какъ вредители хлопчатника.** [Larvae of a species of *Elateridae* as pests of cotton.]—*Agriculture of Turkestan*, no. 10, October 1913, pp. 1040-1041.

The author reports damage done to cotton by larvae of a species of ELATERIDAE. He first noticed this on the 21st April in a cotton plantation in the district of Samarkand; the larvae gnawed through the collar of the root in plants which had already sprouted, also injuring the cotyledons of seedlings. The plants suffered most in their first two stages, while later they were better able to withstand the attacks of the pests. On the date given, the larvae were found at a depth of 2½-3 inches below the surface of the soil; on the 11th May they stopped injuring the plants and were found at a depth of 4-4½ inches; searches made in the first half of June resulted in no larvae being found, they having evidently passed to a considerable depth into the earth.

SEVASTJANOV (J.). **Кровяная тля и мѣры борьбы съ ней.** [*Eriosoma* (*Schizoneura*) *lanigerum* Hausm., and remedies against it.]—*Agriculture of Turkestan*, no. 11, November 1913, pp. 1103-1128, 10 figs.

The author starts with a general historical review of the spread of this pest, and particularly in Russia, where it appeared first in the

Crimea in 1862, spreading in the seventies of the last century to Sotchi and thence to Transcaucasia. As to European Russia, the special investigations conducted by the Ministry of Agriculture in 1896 in the Governments of Bessarabia, Cherson, Podolia, Ekaterinoslav, Taurida, Charkov, Poltava, Kiev, Volhynia, Tchernigov, Kursk, Orel, Smolensk, Mohylev, Poland, and the Don district, showed a total absence of the insects in those areas, its habitat being thus limited to the Crimea and the Caucasus; indeed, fruit-growers in South-Western Russia have often received young apple trees infested with these plant-lice, but the latter have disappeared. The author quotes Mokrzecki, according to whom these lice are less injurious in the Crimea than in Western Europe, which he explains by the fact that in the former country the development of the pests is checked by the unfavourable weather conditions, which the insects meet with in a greater degree the further they move towards the east. Other authors, however, consider these lice to be very injurious, and Rollov, who studied the insects of the Caucasus, gives instances of young trees attacked by *E. lanigerum*, perishing in two to three years, while the yield of fruit on older trees attacked was gradually reduced to nothing. In 1896 special regulations were issued in the Crimea as to the fighting of *E. lanigerum*; these regulations empowered the District Zemstvo of Simferopol to deal with this question through a special committee appointed by the Zemstvo and special superintendents in various districts; they made the notification of the appearance of these pests compulsory upon the owner of an orchard, and while leaving to him the selection of proper remedies, empowered the district superintendent to act on account of the owner in case the latter failed to take the necessary measures, or if the remedies applied by him proved of no effect. They further prohibited the sale and export of trees from nurseries attacked by the pests, and authorised the Zemstvo to destroy trees which, in the opinion of the district superintendent, could not be saved.

As to Turkestan, the appearance of *E. lanigerum* was mentioned in the report of Plotnikov for 1911, and although the injuries done by them are less than those done by other sucking insect pests, there are signs that they are increasing, and they may prove very injurious in the near future. The author thinks that it would be premature to compel the native population to take drastic measures against these lice, as this may have an opposite effect, by creating mistrust of the entomological organisations of the country, which, up till now, have been able to interest the native population in their activity. He addresses himself to the Russian population, urging the necessity of applying energetic remedies during the coming winter.

The author goes on to describe the insect in its various forms, and its bionomics, and points out that there are no parasites known to destroy them. Their known enemies are the larvae of some rapacious beetles, especially lady-birds, and he quotes a statement by Shevirev, who observed the destruction of whole colonies by the larvae of *Euproctis chrysorrhea*.

As preventive measures he suggests the disinfection of nursery stock with carbon bisulphide, describing the method of application, and also the keeping of the trees in a clean healthy state by scraping off the dead bark, smearing with milk of lime, manuring of slow-growing

trees and taking care to smear any wounds on the trees with tar or some greasy material. He recommends the destruction by burning of infested branches or trees, whenever possible, if the trees attacked are not too valuable to be destroyed, and the destruction of the lice by crushing them, even by hand; insecticides may be usefully applied late in autumn and in winter when the lice lose their "down." In crushing the lice with brushes, the use of a poison—Nessler liquid—is recommended, as described by Mokrzecki (about $5\frac{1}{3}$ oz. of green soap, a quarter of a pint of amyl alcohol, one-eighth oz. of carbolic acid, and eight pints of soft water). When the lice are discovered on the roots, the latter may be safely sprayed with this mixture, or, as recommended by Rollov, the earth round the trees must be dug to a depth of about 3–$3\frac{1}{2}$ feet, a solution of milk of lime in water poured over the roots, the latter being afterwards covered with slaked lime and earth. Smearing with carbolineum, and spraying with kerosene emulsion and with quassia is also recommended; for kerosene emulsion the following recipe is given by Plotnikov: $1\frac{3}{4}$ oz. of caustic lime, 3 lb. of kerosene, and 2·7 gals. of water. Radetzky has recommended smearing the trees with a solution of $\frac{1}{2}$–$\frac{3}{4}$ lb. of naphtha soap in 2·7 gals. of water.

A list of eleven Russian works on the subject concludes the article.

CRAWFORD (D. L.) **Control of the Orange Maggot** (*Trypeta ludens*).—*Mexico Gulf Coast Citrus Association, Tampico, Circular* no. 1, 17th Sept. 1913, 5 pp.

The pest known as *Trypeta ludens*, or the orange maggot or fruit fly, is a very serious one. Its attacks are not limited to citrus fruits, of which the following have been found to be infested: Grape-fruit, navels, Boone's Early, Hart's Late, tangerines, citrons, sweet limes and sour-oranges. The eggs are laid within the skin of the fruit in a small puncture made by the ovipositor of the female. They hatch in about ten days, and the tiny maggots eat into the pulp, decay sets in and the fruit drops. After three weeks inside the fruit the maggots work their way into the ground and pupate, and the fly emerges nearly a month later. From egg-laying to the emergence of the adult occupies about three months. The control method already practised, frequent collection and destruction of the fallen fruit, is effective to a certain extent, but poisoned baits should also be used. All fallen fruit should be buried in a deep pit and covered with at least two feet of soil. Burning the fruit is more satisfactory, provided it be done thoroughly, for the maggots are very resistant to heat. Incinerating furnaces are the best for this purpose. The formula for preparing the bait spray is as follows: 6 lb. of dulce syrup (thick), 1 lb. of arsenate of lead (paste), 20 gals. of water. If this cannot be obtained, the following substitute may be used: 1 lb. of white arsenic, 4 lb. of sal soda (washing soda), and 1 gal. of water. Boil these ingredients in an iron vessel for about twenty minutes, or until dissolved. The liquid thus made is arsenite of lime, and must be diluted. It is less satisfactory than arsenate of lead, because it is washed off the trees more easily. This stock solution of arsenite of lime is to be used as follows: 6 lb. of dulce syrup (thick), one pint of arsenite of lime, 4 lb. of freshly slaked lime, and 20 gals. of water. The lime absorbs any free arsenic which would

injure the foliage. One pint of the liquid is sufficient for one tree, and it may be sprayed on the lower and middle branches and fruit. If there is no rain, the bait will last effectively on the trees for about ten days. Success largely depends on applying the spray for the first flies, as well as for the last ones.

ASHBY (S. F.). **Annual Report on the Department of Agriculture for the year ended 31st March 1913.**—*Jamaica, Kingston*, 1913, p. 30.

S. F. Ashby reports that scales have been severe during the drought, on orange and grape-fruit. The two most destructive scales were the purple mussel scale (*Lepidosaphes beckii*) and the citrus snow scale (*Chionaspis citri*) on trunks, branches and twigs mainly. Of less importance on leaf and fruit, were the red scale (*Aspidiotus articulatus*) and the red spot scale (*Chrysomphalus aonidum*). The purple scale is widely parasitised by a Chalcid (*Aspidiotiphagus citrinus*, Crwf)., and in wetter districts by the "red-headed fungus" (*Sphaerostilbe coccophila*).

PIERCE (W. D.) **The Occurrence of a Cotton Boll Weevil in Arizona.**—*Jl. Agric. Research, Washington*, i, no. 2, 10th Nov. 1913, pp. 89-96, 9 figs. 1 pl.

In February 1913, an insect resembling the cotton boll weevil was found breeding in the bolls of a wild shrub known as *Thurberia thespesioides* in Ventana Canyon, Arizona. In May, the author obtained a large quantity of heavily infested bolls of *Thurberia* from the lower part of Stone Cabin Canyon, Arizona. A close examination of the material disclosed many minor points of difference from the usual form of the cotton boll weevil, *Anthonomus grandis*, Boh. In addition to these differences of structure, certain differences of habit were noted; it was found, however, that *A. grandis* would feed upon *Thurberia*, while the Arizona species would equally feed on cotton; and it was possible to obtain crosses of the two forms. It is therefore decided to regard the two as being merely different varieties of the same species. For the Arizona variety the name, *Anthonomus grandis thurberiae*, var. n., is proposed. A systematic description and an account of the life-history are given.

The Arizona weevil may be able to cover considerable distances by flight, especially if compelled to seek sustenance elsewhere. It will, however, probably cleave to its native food-plant so long as this gives sufficiently abundant food, but should the supply for any reason become scarce, it is to be feared that the weevil will take to cotton, to which it would do considerable damage. It is thought that a wholesale destruction of the native food-plant might merely cause the insect to turn its attention to cotton. The matter is now under investigation, but at present it is the author's opinion that the safest plan is to preserve the *status quo* of the weevil in the mountains. An introduction of parasites from the cotton boll weevil would be of considerable assistance in reducing the Arizona weevil, and would not cause its dispersal.

The cotton boll weevil has never been able to invade successfully

the drier cotton sections of western and north-western Texas, although it is probable that it will gradually adapt itself to the more rigid conditions obtaining there. It is of extreme importance that the Arizona weevil be kept out of western Texas and any part of the south-east. If accidentally introduced into other sections, there is reason to believe that it might be able to stand much greater variations of climate than *Anthonomus grandis*, and become a much more serious pest.

DOBROVLIANSKY (V. V.). **Къ біологіи тлей плодовыхъ деревьевъ и ягодныхъ кустовъ.** [On the Biology of Aphis pests of tree and bush Fruit.] **Кіевская Энтомологическая Станція при Южно-Русскомъ Обществѣ Поощренія Земледѣлія и Сельской Промышленности.** [Pubd. by the *Kiev Entomological Station of the South-Russian Agricultural Syndicate*], *Kiev*, 1913, 48 pp.

This memoir is the result of observations on aphids collected by the author during the summer of 1912 around Kiev; his primary object being the study of the life-history of *Aphis pomi*, de G. He first gives the following list of aphids found on certain fruit trees, but does not claim that it is exhaustive. On fruit trees of the genus *Pirus*:— *Myzus mali*, Ferr., *M. pyrinus*, Ferr., *M. pyrarius*, Pass., *Aphis pomi*, de G., *A. fitchi*, Sand., *A. sorbi*, Klt., *A. crataegi*, Klt., *A. pyri*, Koch, *Schizoneura lanigera*, Hausm., *S. pyri*, Goethe, *Rhizoctonus ampelinus*, Horv., *Phylloxera piri*, Mokr. On fruit trees of the genus *Prunus*:— *Phorodon humuli*, Schr., *Rhopalosiphum persicae*, Sulz., *Myzus cerasi*, F., *Hyalopterus pruni*, F., *Aphis prunorum*, sp. n., *A. prunina*, Walk., *A. [illegible]sina*, Walk., *A. persicae*, Klt., *A. pruni*, Koch, *A. prunicola*, Klt., *Lachnus persicae*, Chol. On bush fruit of the genus *Ribes*: *Rhopalosiphum ribis*, L., *Myzus ribicolus*, Klt., *M. ribis*, L., *Aphis grossulariae*, Klt., *Schizoneura ulmi*, L., (*fodiens*, Buckt.), *S. grossulariae*, Schule. On bush fruit of the genus *Rubus*: *Macrosiphum rubi*, Klt., *Aphis idaei*, Goot., *A. urticaria*, Klt., *A. mordwilkiana*, sp. n.

Aphis pomi. The author found these aphids mostly on apple and pear trees; also on white thorn, *Cydonia vulgaris*, Pers., (quince), *Mespilus germanica*, L. (common medlar), and on *Cotoneaster vulgaris* Lindl. (medlar var.) On apple and pear trees they first suck the buds, then the lower sides of young leaves and shoots; from June onwards they are found mostly on the lower sides of leaves of apple, while on pear trees they are found less frequently; in the autumn they were found only on the leaves of apple. The development of the larvae, from birth till after the last moult, occupied 2 weeks in April, while in May and in June it was only 10 days. The number of larvae produced by each parthenogenetic female was 25–30, in the case of wingless specimens, and 20–25 in the case of winged ones. Amongst their natural enemies the author records, *Exochomus quadripustulatus* in April, while in June larvae of another ladybird were found, as well as those of Syrphid flies; in July and August the larvae were destroyed by the larvae of *Bremia*, as well as by *Coccinella 14-punctata*, L., in August. Some specimens were infected by a parasite, and the author noted some secondary parasites: *Pachyneuron aphidis*, Bouché, *Encyrtus aphidivorus*, Mayr, and *Lygocerus* sp. The author is satisfied that there is no total disappearance of these aphids from apple trees during the summer, but that they pass their whole life-cycle on them;

(2) that it is most unlikely that any migrations take place; (3) that the decrease in their numbers depends upon the decrease in the fertility of the viviparous females; dissections of females taken at different periods of the season have shown that their fertility remains constant from May to July, while it decreases by one-half in August.

Aphis sorbi was rare. The author did not find them on cultivated fruit trees, although other observers report that they attack apple.

Aphis crataegi. According to Mordvilko this species migrates during the summer from the white thorn to certain grasses which serve as intermediate hosts; the second generation consists almost exclusively of winged migrating females, which start a new generation on *Ranunculus.* These were previously considered to be a distinct species, *Aphis ranunculi*, Klt. The author's observations have confirmed the statements of Mordvilko. Besides white thorn, he found the stem-mothers also on apple trees. On the same trees he found also, inside some curled leaves, aphids which strongly resembled specimens of *A. crataegi*, and which were described by Kaltenbach as a generation living specially on apple trees. According to Mordvilko *A. crataegi* migrates also to *Aethusa* (fool's parsley). The damage done by the form found on apple trees is very great. The author reared from the stem-mothers of *A. crataegi*, a parasite, identified by Kurdjumov (by whom all the other parasites mentioned were also identified) as *Ephedrus lacertosus*, Hal.

Phorodon humuli lives on thorn bushes, on *Prunus insiticia*, L. (bullace), and on plum trees, migrating to *Humulus lupulus*, L. (hops). At the same time the author found that some individuals pass the whole summer on plum trees. Those found during the summer on hops are exclusively wingless females, only the last generation, consisting of winged specimens, migrating back to the plum trees. These aphids do not visibly injure plum trees, but cause great damage to hops, being the most dangerous pest of these plants.

Myzus cerasi was found by the author during the whole summer, after 9th June, on cherries, there being practically no winged females. His observations did not confirm the statement by Kessler that these aphides migrate in the summer, although he is unable definitely to dispute this statement. The damage done by them to cherry trees is very great, when they appear in large numbers. The author found the following insect enemies: Larvae of a Chrysopid, of *Bremia* and of Syrphid flies; imagos of *Coccinella bipunctata*, L.; he found also empty skins of aphids, from which some parasite had emerged.

Hyalopterus pruni. The author confirms the discovery by Mordvilko that this is synonymous with *H. arundinis*, F., which is found in summer on reeds, to which they migrate from plum trees, returning to the latter in autumn. Some, however, do not migrate at all, so that from June to August they can be found on both the primary and intermediate host plants. Besides plum trees they are also found on apricots, peach trees, thorn-bushes (*Prunus spinosa*, L.) and on *Prunus insiticia*, L. The sucking of these aphids affects the leaves but little, but they assist the development of a fungus (*Capnodium salicinum*, Mont.), and cause considerable damage by attacking unripe fruits at the beginning of summer. These aphids were found to be destroyed by Syrphid larvae and by those of *Bremia*; many specimens

were infected by *Praon flavinode*, Hal., out of some of which the author reared a hyperparasite, *Lygocerus* sp.

Aphis prunorum, sp. nov. These were identified by Mordvilko as a new and undescribed species, and the author gives descriptions of the winged and wingless parthenogenetic female, larvae, nymph, and sexual female. He found large colonies of these insects on a young, green shoot of an apricot tree on the 6th June, consisting of wingless females, nymphae and young larvae; on the 9th July they were found, mostly as winged females, nymphae and larvae of all stages, on leaves of apricot trees; on the 22nd July only winged females and nymphae were found, and from the 29th July till the 9th September no specimens could be found on any plants; on the last date they were again observed on leaves of plum trees, where they were found until the 30th October. Evidently they migrate in the summer to some intermediate host plants.

Aphis pruni. The author found larvae and wingless females on young leaves of plum trees on 29th May, but by the end of July the insects had entirely disappeared from these trees, being found instead on *Cynoglossum officinale*, L. (dog's tongue) during July-August. But the author is satisfied that these two, *A. cardui*, L., and *A. pruni*, Koch, are synonymous, and that the latter form migrates in the summer to some intermediate host plants, returning in the autumn to plum. He further thinks that it is probable that the species described by Koch as *A. jacobaeae*, Schr., *A. symphyti*, Schr., *A. chrysanthemi*, Koch, and *A. carsellae*, Koch, are all synonymous with *Aphis cardui*, L. s. *pruni*, Koch. *A. pruni* also occurred on young shoots of apricot trees, as well as on *Prunus spinosa*, L.; a large proportion of those found on the latter plant were infected by the parasite, *Lysiphlebus* (*Aphidius*) *cardui*, Marsh.

Rhopalosiphum ribis. The author's observations again confirm those of Mordvilko, to the effect that this species migrates in the summer from its chief host plant, black currant, to various species of *Sonchus* (sow thistle). He found many enemies and parasites of these flies; they were devoured by larvae of ladybirds and of Syrphid flies and by bugs of the genus *Anthocoris*; he also reared the parasites *Praon volucre* Hal., and *Ephedrus lacertosus*, Hal.; from these parasitised specimens the hyperparasites, *Pachyneuron* sp. and *Lygocerus* sp., were also reared.

Myzus ribicolus. The author's attention was called to this species only in the autumn, when he found them on the 6th September on black currant; he failed to distinguish them in the spring, owing to their similarity to *Rhopalosiphum ribis*; they were not to be found on currants during the summer.

Myzus ribis. These were found during the whole summer and autumn on black and red currants. They do not harm black currants, but produce bright red protuberances on leaves of red currants. The author found that they were destroyed by larvae of one species of Syrphid, and by those of the *Bremia*; a considerable number were infected by *Lysiphlebus* (*Aphidius*) *ribis*, Hal.

Aphis grossulariae. According to the author these are the most injurious of all the currant aphides; he found them from the 23rd April to the end of October. The following enemies of these lice are reported: Syrphid larvae, larvae of *Bremia*, the beetles *Exochomus quadri-*

pustulatus, L., some predaceous bugs, and the parasite ***Lysiphlebus cardui***, Marshall, var.; the latter playing an important part in the destruction of the insects.

Schizoneura ulmi. These lice were found in May on *Ulmus effusa*, Willd., and on *Ulmus montana*, With., in galls on the leaves; the second generation consisted of winged females, which migrated during June to the roots of red and black currants (*Sch. fodiens*, Buckt.). In September and October the winged sexes flew back to the chief host plants. The author states that they are distinctly injurious to currants when present in any numbers. The only remedy is to remove all elm trees from the orchards attacked, as they winter on elms, and cannot exist without them.

Macrosiphum rubi. This species was found in July, and afterwards during the whole summer and autumn on leaves of raspberry bushes, but always in small numbers. No damage by them was noticed.

Aphis idaei. Found on raspberry bushes in May and during June; they disappeared afterwards. The damage done by them to raspberries is great.

Aphis mordvilkiana, sp. nov. This new species was found by the author in September underneath leaves of raspberry bushes. He thinks it probable that the lice were there before, but were not distinguished by him from larvae of *Macrosiphum rubi*, Klt., which they resemble at first sight. They rested on the leaves singly, chiefly along the veins; underneath one leaf some dozens of specimens were found. All the specimens noticed were wingless females and their larvae; no winged females, nymphae, or males were found. On October 15th, the author found groups of eggs of this species on branches of raspberry bushes, near the buds. The majority of the eggs had already turned black, but freshly laid eggs, as well as ovipositing females were also found.

PARKER (W. B.). **Flour paste as a control for red spiders and as a spreader for contact insecticides.**—*U.S. Dept. Agric., Bureau Entom., Washington, Circ.* no. 166, 30th Jan. 1913, 5 pp., 2 figs.

Flour paste is not only a suitable "spreader" for lime-sulphur solutions, but it apparently serves, to some extent, as an active insecticide. Each gallon of paste contains 1 lb. of flour, and the addition of four gallons of paste to 100 gallons of lime-sulphur causes the spray to adhere to the leaves as a thin film, increasing its efficiency almost threefold, mainly owing to the spreading effect of the paste. A series of trials was made with nicotin sulphate against the hop aphis (*Phorodon humuli*) in which flour paste at the rate of four gallons to 100 gallons of the nicotin sulphate solution at strengths of one in 2,000, and one in 3,000 was employed. In these trials from 99 to 100 per cent. of the aphides were destroyed. It was observed that many of the smaller aphides were pasted on to the leaves. Accordingly, flour paste without any other insecticide was tried, and when used at the rate of eight gallons (= 8 lb. flour) in 100 gallons of water or even stronger (say 10/100 or even 12/100) most of the young and tender aphides (97 per cent.) and of the red spiders (*Tetranychus bimaculatus*) were killed. No damage was done to the hop plants, even when in full

chown. The older and stronger aphides, and the eggs of the red spider, were not killed by the flour paste. To deal with the latter, it was found necessary to make a second application, seven or ten days later, in order to reach the mites that emerge from the eggs. In a series of five experiments against red spiders on hops with flour paste at the rate of 8 : 100, it was found that from 99·8 to 100 per cent. were killed. This paste solution is exceedingly cheap. It has been used successfully against red spiders on beans, chrysanthemums, hops, cucumbers (in greenhouse and field), pumpkins, pears, prunes, roses (in field), and violets (in greenhouse and field). The chrysanthemum leaves may become spotted if spraying is done too near the time of blooming. Flour paste was not satisfactory when used upon greenhouse roses and carnations or field sweet peas. To prepare the flour paste, mix a cheap grade of wheat flour with cold water, making a thin batter, without lumps, or wash the flour through a wire sieve with cold running water and make up to one gallon of water to each 1 lb. of flour. With constant stirring to prevent burning and caking, cook until the paste is formed. It will be necessary to add sufficient water to balance loss by evaporation. Ineffective spray is due to insufficient cooking. When overcooked, the paste hardens when quite cold and cannot be easily mixed with water. Usually, overcooking is not disadvantageous. In the spray tank the paste tends to settle, and the solution must be agitated to ensure good results, but it shares this slight disadvantage with most materials. It is a most effective spreader for lime-sulphur and nicotin sulphate sprays, is easily obtainable, and has no odour like fish-oil soap. Used alone at a strength of 8 : 100, it is effective against several leaf-feeding mites and some very delicate aphides. From observations made during four months, it seems possible that flour paste may be useful as a spreader for lime-sulphur for scale-insects and fungi, and as a " sticker " for arsenicals.

Prohibition of Removal of Certain Diseased Plants. *Proclamation of the Governor of South Australia, Adelaide*, 15th May 1913.

The Governor, with the Executive Council of South Australia, by virtue of the provisions of " The Vine, Fruit and Vegetable Protection Acts, 1885 and 1910," prohibit the removal of citrus trees or the fruit of citrus trees from any part of the State into a stated portion of the Murray Valley (25 miles on either side the river), and also declare that no citrus trees or fruit shall be removed between the areas described unless examined by an inspector and declared free from red scale (*Aspidiotus coccineus*), and all such trees or fruit must be despatched in new cases or packages. Such consignments on arrival at their destination are to be re-examined by an inspector before delivery to the consignee.

Important Amendments to Codling-moth Regulations. Fruit Removal Regulations (*Proclamation No.* 20 *of* 1913).—*Agric. Dept. of Union of S. Africa, Pretoria*, no. 16, 6th May 1913, 10 pp.

By Proclamation 20 of 1913, Proclamation No. 38, dated the 22nd February 1912, is superseded and repealed. The regulations applying to vines, grapes and mango trees are unaltered, while the change with

respect to apples, pears and quinces, is that of omitting a number of districts from the area of the Cape Province, into which the removal of these fruits has been prohibited for the past seven years. Care is necessary to avoid the removal of prohibited fruit into "protected" portions of the Union, and every wrongful removal is to be reported to the Magistrate of the district in which the offence occurred, and the consigner and consignee may both be punished. The protected areas are enumerated, and removals are not allowed from one protected area into another. The removal of boxes, etc., that have been used for the storage or conveyance of apples, pears and quinces into areas into which the removal of these fruits is prohibited is illegal. The return into a protected area of boxes, etc., that have been used for the conveyance of any of the fruits named, to any place outside of that area is not allowed. It is also illegal to use second-hand apple-barrels, pear-boxes, etc., for the sending of any produce into a protected area. Travellers by train and cart would be violating the restrictions if they took any prohibited fruit into a protected area. The removal of the restricted articles through a protected area in direct transit by rail or post from a place outside of it to a place outside of it, is allowed. The object of the regulations is to check the spread of codling-moth into parts of the Union which are still supposed to be free from this pest, and which are considered generally suitable for the culture of apples or pears. The contraction of the protected Cape area was prompted by the presence of the pest in many places within the parts now omitted from the protected area. The presence of the pest, to a very small extent, is suspected in many places within the still protected areas, and as a check on its spread from sources within, the Government issued Notice 366 of 1912. The effectiveness of these various measures in retarding the spread of the codling moth will depend to a great extent on the alertness of parties within the protected regions in detecting and reporting any infringements. Besides repealing Proclamation No. 38 of 1912, Proclamation 20 of 1913 also announces certain restrictions as to the removal of grape vine, virginia creeper, ampelopsis or other plant of the natural order, Vitaceae, or any living portion (except seed), or fresh food of any such plant, and of any mango trees or any portion thereof (except the fruit), and of apple, pear or quince fruit in its fresh state. The areas protected and not protected in respect of these different fruits are set out, as also the various lines of railway along which the transit of the plants and fruit mentioned in the amendment, may or may not be carried.

FULLER (C.). **The Wattle Bagworm.**—*Agric. Jl. of Union of S. Africa, Pretoria*, vi, no. 2, Aug. 1913, pp. 198-217, 9 pl.

The present paper is a continuation of that which appeared in Vol. 5, No. 6 of the *Agricultural Journal of the Union of S. Africa* [see this *Review*, Ser. A, i, p. 303.] The life-history of the wattle bagworm (*Chalioides junodi*, Heylaerts) is given. The male moths begin to emerge, and the females become adult during July. In August egg-laying begins, and towards the middle of the month the young larvae appear. By September egg-laying is finished, the adult moths die off, and the main brood of young emerge from the maternal bags. In the

months from October to February the larvae feed and grow, the greatest damage being done from November to January. In March the larvae discontinue feeding and prepare to pupate, the males first, and later the females; pupation occurs during April, May and June. Although in the caterpillar stage no difference between male and female is evident, the pupae differ markedly. The adult female is a segmented spindle-shaped organism, bearing no resemblance to a moth, having neither wings nor legs. She never leaves her bag, and in this some 600 eggs are laid, in a mass of wax-like secretion mixed with scales.

Shortly after the eggs hatch, the young larva, instead of beginning at once to feed, drops from the base of the bag, supported by a gossamer strand, and sways about in the air, until it comes in contact with some object on a lower plane; it then ascends its strand again and remains upon it for a day or two, making no attempt to feed, however near food may be. The author suggests that this is a device to aid in the dispersal of the species; birds flying through plantations would be apt to pick up on their beaks, feet or feathers, the glutinous gossamer threads to which the insects are attached, and the insects would thus be deposited in another locality. This habit of the larvae may account for their spread by the wind, which would transport the leaves to which the threads are attached.

WARREN (E.). **On the Economic Value of Wild Birds.**—*Agric. Jl. of S. Africa, Pretoria*, vi, no. 3, Sept. 1913, pp. 461 465.

The author points out the immense value of birds as destroyers of injurious insects, ticks, etc., and contends that the benefits they confer upon the stock-farmer and agriculturist, far outweigh the relatively small amount of damage they may do, except in the case of a few species. He then mentions a number of useful South African birds, giving a general indication of the nature of their food. It is pointed out that in many parts of South Africa the lack of cover and widespread grass fires are very prejudicial to bird-life; and farmers are urged to pay some attention to the needs of birds. Strips of bush should be reserved as cover, and in open country trees should be planted in the vicinity of cultivated lands, so as to furnish suitable breeding places; for it is when birds are feeding their young that they are specially active in destroying insects.

LOUNSBURY (C. P.). **Pernicious Scale.**—*Agric. Jl. of S. Africa, Pretoria*, no. 4, Oct. 1913, vi, pp. 662–670.

It is now a little more than two years ago that Pernicious (San José) Scale, which has the reputation of being the most serious of all the numerous scale pests of deciduous fruit trees anywhere in the world, was discovered to be present in South Africa. The Government at first decided to attempt the eradication of the new pest by burning infested trees and plants. Owing to the immensity and cost of the undertaking, the Government, in April 1912, decided to leave the eradication or suppression of the pest on any particular property to the enterprise of the occupier or owner. The dissemination of the pest was due wholly, or in large part, to purchases of trees from one

nursery at Pretoria and one at Pietermaritzburg, and had been going on at least since 1906. The response of the occupiers to the appeal for suppressive action was, on the whole, gratifying, but many took no action at all, and others sprayed to little effect, probably owing to slovenly application. Lime-sulphur wash and "Scalecide" have both proved highly efficient as spraying fluids. One thorough spraying every winter is evidently all that is required to prevent damage to a tree; but two or three thorough sprayings in one winter may be necessary to get the pest well under control in the case of trees which have been allowed to become badly infested by neglect in one or more years. The measures that the Government is applying to prevent the rapid dissemination of the insect are chiefly those relative to nurseries and plant traffic, intended to check the spread of plant pests in general. Special instructions were given to railway and postal officials, who send non-certificated plants to an Agricultural Department plant inspector for examination before they are forwarded for delivery. Special legislation applies to Pretoria, it being illegal to remove any plants from the town without the written permission of the Department of Agriculture. It is also illegal to remove any woody plants from a property known to be infested with the insect anywhere in the country. A general inspection was made between August 1911 and April 1912, and the towns and places where the pest was found are given, and in a general way, the position in July 1913. The towns and places inspected are in the Transvaal, Orange Free State and Natal.

MARTELLI (G.). **La lotta naturale contro il Crisomfalo (Bianca-rossa), gli Afidi (Formichedda), la Mosca (Verme) delle arance, delle pesche ecc. e la Mosca (Verme) delle olive.** [Use of natural enemies against *Chrysomphalus*, Aphididae, the Mediterranean Fruit Fly and the Olive Fly.] *Giorn. Agric. Meridionale, Messina*, vi, nos. 8-9, Aug.-Sept. 1913, pp. 137-142.

The successful introduction of *Novius cardinalis* against *Icerya purchasi*, Mask., in the province of Messina and elsewhere, and the possibility of obtaining good results with parasites of other injurious insects led the Cattedra ambulante d'Agricoltura in Messina to introduce as many of such enemies as possible. It is due to F. Silvestri that the Coccinellids, *Rhizobius lophantae*, *R. ventralis* and *Orcus chalybaeus*, which prey upon *Chrysomphalus* and other injurious Coccids, and *Hippodamia convergens*, an enemy of aphids, have been imported. He also brought two other parasites: *Galesus silvestrii*, Kief. and *Dirhinus giffardii*, Silv., into Italy to combat the Mediterranean fruit fly, and then found that they would breed in the olive fly. It is therefore hoped that these parasites will be efficient against both these pests in peach, orange, and olive-growing districts where the soil is loose and sandy. As yet it is not known whether the parasites will become acclimatised, but from the Naples district, where some of them were introduced some time ago, the reports are most satisfactory.

BALLOU (H. A.). **Report on the prevalence of some Pests and Diseases in the West Indies during 1912.**—*West. Ind. Bull., Barbados*, xiii, no. 4, 22nd Sept. 1913, pp. 333-357.

The information presented in this report covers most of the

agricultural pests and diseases in the West Indies. An easy form of reference is provided by tables showing the observations of their occurrence and non-occurrence. The insect pests referred to are as follows:—

Cacao pests:—Thrips (*Heliothrips rubrocinctus*, Giard), noticed in Grenada, St. Vincent, St. Lucia, Dominica, St. Kitts; cacao beetle (*Steirastoma depressum*, L.), in Grenada; scale-insects and mealy bugs in Grenada, Dominica, St. Kitts, Virgin Islands; the greengrass bug (*Nezara viridula*, L.), in Grenada; Aphis in Nevis.

Coconut pests:—Weevil (*Rhynchophorus palmarum*, L.) and white fly (*Aleyrodicus cocois*, Curtis), in St. Vincent; coconut snow scale (*Diaspis boisduvali*, Sign.), glassy star scale (*Vinsonia stellifera*, Westw.), Bourbon aspidiotus (*Aspidiotus destructor*), coconut mealy bug (*Pseudococcus nipae*, Mask.), and green scale (*Coccus viridis*, Green) in Grenada, St. Vincent, St. Lucia, Antigua, St. Kitts, Nevis, Virgin Islands: termites in Nevis.

Indian corn pests: Corn ear worms (*Chloridea obsoleta*, F., and *Laphygma frugiperda*, S. and A.), in St. Vincent, Antigua, St. Kitts, Nevis, Virgin Islands; hard-back grubs (*Lachnosterna*), in Antigua. The ripening heads of guinea-corn were attacked by caterpillars (not described) in Montserrat.

Cotton pests:—The cotton worm (*Alabama argillacea*, Hb.), noticed in St. Vincent, St. Lucia, Montserrat, Antigua, St. Kitts, Nevis, Virgin Islands; the boll worm (*Chloridea obsoleta*, F.) and *Laphygma frugiperda*, S. and A., in Antigua; the cotton stainers (*Dysdercus andreae*, L., and *D. delauneyi*, Leth.), in Grenada, St. Vincent, St. Lucia, Montserrat, Antigua, St. Kitts, Nevis, Virgin Islands. Scale-insects (*Saissetia nigra*, Nietn., and *Hemichionaspis minor*, Mask.), in Grenada, St. Vincent, Antigua, Nevis, Virgin Islands; the flower-bud maggot (*Contarinia gossypii*, Felt), in Montserrat and Antigua; the leaf-blister mite (*Eriophyes gossypii*, Banks), in St. Vincent, St. Lucia, Montserrat, Antigua, St. Kitts, Nevis, Virgin Islands; a hard-back beetle (*Cyclocephala dimidiata*) in Grenada; a small bronze beetle and a bug (*Edessa meditabunda*), in St. Vincent; cotton aphis (*Aphis gossypii*, Glover), in Montserrat, Antigua and Nevis.

Pests of green dressings: Pigeon peas were attacked by the beetles *Bruchus chinensis* and *B. quadrimaculatus*, in Dominica; a caterpillar (known locally as the Bengal bean worm) attacked horse beans in Montserrat and cowpeas in Antigua; a weevil (*Exophthalmus esuriens*, Boh.) was found on pigeon peas in Antigua, where Barbuda beans were infested by an aphis.

Pests of limes and other citrus trees:—Scale-insects, especially *Coccus viridis*, Green, are still doing much damage in St. Vincent; all the commoner kinds occurred in St. Lucia, the green scale (*C. viridis*) and the snow scale (*Chionaspis citri*, Comst.) being the most troublesome. One or two outbreaks of scale-insects were reported from Dominica; the purple scale (*Lepidosaphes beckii*, Newm.) and the green scale were noticed in Montserrat, where for the first time limes were seriously attacked by the West Indian red scale (*Chrysomphalus aurantii*, Mask.). The lantana bug (*Orthezia insignis*, Douglas) is very scarce in Montserrat; scales were common in Antigua; they are abundant wherever there are lime trees in St. Kitts; green, purple and snow scales occurred in Nevis; white scale and purple scale in

the Virgin Islands. The bark-borer (*Leptostylus praemorsus*, F.) was noticed in St. Lucia; the twig-borer (*Elaphidion mite*, Newm.), in Antigua; the fruit fly (*Ceratitis capitata*, Wied.), in Dominica.

Sugar-cane pests:—The moth borer (*Diatraea saccharalis*, F.) noticed in Grenada, St. Lucia, Antigua, St. Kitts, Nevis; the weevil-borer (*Metamasius sericeus*, Oliv.), in St. Lucia, Antigua, St. Kitts; the root-borer (? *Exophthalmus esuriens*), in St. Lucia, St. Kitts; termites in St. Kitts; hard-back grubs (*Lachnosterna* spp.), in Antigua, St. Kitts, Virgin Islands.

Sweet potato pests:—Horn-worms (*Protoparce cingulata*, F.), in Antigua and Virgin Islands; the scarabee (*Cryptorhynchus batatae*, Waterh.), in Grenada and St. Kitts; the red spider (*Tetranychus telarius*, L.), in St. Lucia, Antigua, and Nevis; a white fly (species unknown), in Grenada.

Yam pests:—The yam scale (*Aspidiotus hartii*), in Grenada; the scale that occurs on the stored tubers was observed in St. Kitts.

It is stated that the canes on one estate—the locality of which is not given—were infested with shot-borer, wherever the attacks of rind fungus, and other fungus diseases occurred severely. Grasshoppers are a great pest in many districts, especially in dry localities, and flocks of guinea-fowl are successfully kept for the purpose of controlling them.

Regarding parasites of injurious insects, it is stated that *Cephalosporium* fungus has done good work on the mango shield-scale in Grenada, and *Sphaerostilbe* has increased rapidly in the St. David's district, Grenada. In St. Vincent and St. Kitts, *Chalcis* sp. and the Jack Spaniard wasp (*Polistes annularis*) control the cotton worm to a noticeable extent, and planters are encouraging the wasps by erecting rough shelters for them in or near the cotton fields. The white-headed, black-headed, and red-headed fungi parasitised the scales on lime trees in St. Lucia, and, although not so general, the buff shield-scale fungus was well established in some districts. In Antigua, parasitic fungi on scale-insects are much more common than was realised some time ago. Lady-birds are increasing on some lime plantations.

MacDougall (R. S.). **The Large Narcissus Bulb Fly** (*Merodon equestris*, Fab.)—*Jl. Board Agric., London*, xx, no. 7, Oct. 1913, pp. 594–599, 2 figs.

The narcissus fly, first recorded in England in 1869, is responsible for a great destruction of narcissus bulbs in different parts of the country. In addition to bulbs of the genus Narcissus, the larva has been found in bulbs of Amaryllis (Adams), Habranthus (Chittenden), Vallota (Chittenden and Theobald), Eurycles (McLachlan), Lilies (Wilks), and Galtonia (Theobald). Theobald found the larvae at work (at Wye and in Devon) in the bulbs of the Wild Hyacinth (*Scilla nutans*), and, partly on this, bases his opinion that *Merodon equestris* is native to England. The larvae tunnels and feeds in the bulb, which may be so spoiled that it rots away completely. In other cases flowers and weakened plants may be produced, but no new bulbs. It is often difficult to say without opening the bulb that a *Merodon* grub is present within, but in typical cases the infestation can be recognised by the bulb "giving" on being squeezed between the finger and thumb.

Treatment :—(1) Failing bulbs and plants should be removed from the beds and destroyed ; (2) destruction of all decayed and infested bulbs at the time of lifting and also, especially in case of importation, before planting : in daffodil-growing grounds, where some years ago *Merodon* was proving a great pest, the persistent examination for, and destruction of, sickly bulbs has resulted in its being the rarest occurrence now to find a *Merodon* ; (3) sifting the surface layers of the soil, where this is practicable, for pupae ; in Holland the surface layers are searched about the time that the plants are coming into flower ; (4) steeping the bulbs in water for from two to eight days, in order to drive out and drown the larvae ; a number of experiments show that while good results may follow, there are failures also ; (5) catching the flies with hand-nets ; this is a valuable measure.

Theobald, in his second British Museum Report (1904), recorded the finding in bulbs of narcissus of another Syrphid larva, which proved to be *Eumerus strigatus*, Fall. It infests onions, shalots and the bulbs of the hyacinth, either alone or along with *Merodon*. A number of *Eumerus* larvae may be present in a single bulb. Infested bulbs become discoloured, and rot away. The author has found numbers of *Sciara* larvae in bulbs of Glory of Leiden and Duchess of Westminster, and has at different times bred species of several genera of MYCETOPHILIDAE from decaying bulbs.

PICARD (F.). **Le *Cleonus mendicus* et le *Lixus scabricollis*, Charançons nuisibles à la Betterave dans le midi de la France.** [*Cleonus* (*Temnorrhinus*) *mendicus* and *Lixus scabricollis*, Weevil Pests of Beetroot in the South of France.] —*Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux*, xii, no. 5, Oct. 1913, pp. 129–137, 1 pl.

Though not so largely grown as in the North of France, beetroot is also cultivated in the Mediterranean region, where its pests are generally of species different from those found in the northern provinces. Though the black aphis (*Aphis euonymi*, F.), and the beet fly (*Pegomyia hyoscyami*, Meig.) occur nearly everywhere, the flea-beetle (*Chaetocnema tibialis*, Illig.) and the beet moth (*Phthorimaea ocellatella*, Boyd) become commoner as one advances southwards. The weevils, *Temnorrhinus mendicus*, Gyl., *Bothynoderes punctiventris*, Germ., and *Lixus scabricollis*, Boh., are exclusively southern species. Valéry Mayet has studied *T. mendicus* thoroughly, but *Lixus scabricollis* and its habits are nearly unknown. After emerging in autumn the adult *Temnorrhinus* passes the winter underground and appears in April or May. The date of its appearance depends solely on climatic conditions, and thus all the beet fields are invaded simultaneously. If alternate crops are grown the weevils travel immediately to the new ground, guided apparently by their sense of smell. The eggs are laid in the ground near the collar of the plants, and by the end of May almost every adult is dead. Because of its earthy colour and its habit of remaining under clods or close to the plant the insect is not always noticed by cultivators, and even a severe infestation can only be detected by a careful examination. On hatching, the larva tunnels the surface of the young root. Later on the hole is increased in size, but is not made deeper. The work tends downwards, and only the

underground portion of the root is attacked. At the end of September many larvae are still present in the roots, but pupae and some adults also are to be found. The latter either remain in the pupal chamber or emerge into the open. On warm sunny days they may be seen feeding on the leaves. Collectors consider *T. mendicus* to be rare, but it fairly overruns the beet-fields of the Agricultural School at Montpellier in Hérault. In 1913 all the roots there had been attacked. The necessity for a mild climate and compact clay soil limits its spread, for beetroot can only be successfully grown in a loose deep soil. Wherever *Temnorrhinus* finds its favourite plant under the above conditions, it speedily develops into a terrible pest. In Russia and Hungary *B. punctiventris* and *B. betavorus*, Chev., are only too well known. The former is also a southern species, but is rare in Hérault, as it requires a sandy soil. Many Cleonids living on Salsolaceae will attack beetroot. Thus *Temnorrhinus brevirostris*, Gyl., is a species found on the Mediterranean coast on Kelp (*Salsola*) and on *Atriplex*. So far it has not been found on beetroot, but *Chromoderus fasciatus*, Müll. (*albidus*, F.), which is common on *Atriplex*, *Chenopodium*, *Salsola*, etc. has been reported as a beet pest in Central Europe. Though very abundant in Hérault, the author has not observed it in the beet-fields there. As regards *Cleonus piger*, Scop. (*sulcirostris*, L.) most writers notice it as a beet pest, but one of little importance. Indeed the author believes it not to be such. *Temnorrhinus* has few enemies; no Hymenopterous parasite is known, but Sphegids of the genus *Cerceris* prey on it, though not to any great extent. In pursuing his investigations on *Cocobacilli* as insect parasites the author found one of these bacteria in the larvae of *T. mendicus*, which he provisionally named *Bacillus cleoni*. It remains to be seen whether it differs specifically from *Bacillus cajae* discovered in *Arctia caja* by G. R. Blanc and the author.

When the larvae have penetrated into the root the damage is past remedy. The adults must be destroyed when feeding, prior to oviposition. Valéry Mayet recommended arsenicals, and especially a solution of 5 oz. sodium arsenite in 20 gals. of water, to which 2 lb. of flour had been added to make it adhere. The ordinary arsenate of lead sprays may be used also. Spraying must be done before oviposition takes place, and beetroot sprayed in April can be fed to cattle in October without any danger whatever.

Lixus scabricollis, Boh., is practically of no economic importance. It is parasitised by a Braconid of a species as yet unknown, but which the author will describe shortly. *L. ascanii*, L., and *L. junci*, Dahl. have long been known as beet-feeders, but they also seem of little importance. They are sometimes found on spinach.

FEYTAUD (J.). **Les Hémérobes ou Chrysopes** [*Chrysopa*.]—*Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux*, xii, no. 5, Oct. 1913, pp. 138-148, 3 figs.

The *Chrysopa* most common in France are *C. vulgaris*, Schn., *C. perla*, L., *C. septempunctata*, Wesm., and *C. aspersa*, Wesm. *C. vulgaris*, which may be taken as a type, is pre-eminently carnivorous. Already known as a destroyer of Aphids, the perfect insect has been also observed killing the caterpillars of *Polychrosis botrana*. The egg is

attached to a stem about 6 or 7 mm. long, which the female produces prior to laying. The larva is very agile and even more voracious than the adult. *Chrysopa* are mostly known as enemies of aphids, but according to Schneider they also prey on the larvae of Muscidae and Coleoptera. In the vineyards, *Chrysopa* also attacks *Phylloxera* in its stages above ground, and here again the larva is the chief destroyer. Fuschini has calculated that one larva can devour about 6,000 eggs, besides causing the indirect destruction of those contained in the ovaries of the female. The larvae of *Nephopteryx dicisella*, Dp., and *Hylotoma rosae*, F., also fall a prey to *Chrysopa*. *C. vulgaris* has been described as an enemy of the Vine Tortrix ("Pyrale" de la vigne) (*Oenophthira pilleriana*, Schiff.) In 1911, the author reported an abundance of *Chrysopa* in the south-eastern vineyards, which had been invaded by the Microlepidoptera of the vine, and showed clearly that *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff., were destroyed by *Chrysopa* larvae, and even by the adults. Experiments conducted in 1913 showed that a single larva could eat about 60 *Polychrosis* caterpillars, at the rate of 3 or 4 a day. The agriculturist should therefore learn to know and protect so helpful an auxiliary. The author very strongly recommends that all traps baited for the moths of *Polychrosis* be emptied and cleaned immediately they cease to be useful, as *Chrysopa* are also taken in them. Indeed it has been found that they capture *Chrysopa* more often and in larger numbers than *Polychrosis*, thus doing a great deal of harm. Birds, especially night-birds, and bats are great enemies of the perfect insect, and Syrphid larvae have been seen to destroy *Chrysopa* larvae. *Hemiteles ostralis*, Gr., *Helorus anomalipes* Pz., and *Microgaster perlae*, are all parasites of *Chrysopa* larvae, and *Telenomus acrobates*, Giard, parasitises their eggs. A bibliography of 18 works completes the paper.

Cacoecia costana.—*Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux*, xii, no. 5, Oct. 1913, pp. 156–157.

In an editorial note mention is made of the occasional ravages of *Tortrix* (*Cacoecia*) *costana* in vineyards. Henri Kehrig (*Feuille vinicole de la Gironde*, 22nd May 1890, and *Bull. Soc. de Zoologie Agric.*, Dec. 1911), Dr. Schwangart (*Mitt. d. deutschen Weinbau-Verein*, June 1911), and F. Picard (*Progres Agricole*, 5th May 1912), have reported this pest in the Gironde, the Palatinate, and in Camargue.

Quarantine Regulations on Shipment into Georgia of Articles from Territory Infested with Mexican Cotton Boll Weevil.—*Georgia State Bd. Entom., Atlanta, Circ.* no. 13, Oct. 1913.

At a recent meeting of the State Board of Entomology, the following regulations were adopted concerning shipments from sections of the country infested with Mexican cotton boll weevil. Restrictions were placed on the following articles when originating in infested areas:—(1) Seed cotton; (2) cotton seed; (3) seed cotton sacks, cotton seed sacks, cotton pickers' sacks which have been used within eight months; (4) cotton seed hulls, between 1st Aug. and 30th Dec.;

(5) Spanish moss and corn in shuck, or shucks removed from corn, between 1st Oct. and 30th June; (6) household goods containing any of the foregoing articles, during the period of quarantine applying to each; (7) living weevils in the possession of any person outside of the infested territory, except a qualified entomologist. Under certain conditions restricted articles can be shipped from uninfested sections of States in which boll weevil occurs.

No restrictions were placed on the following articles:—(1) Bales of cotton, flat or compressed, with no restrictions as to season; (2) linters and loose cotton lint; (3) cotton seed meal, cake and oil; (4) corn, shelled or shucked, or with shucks removed, oats or any other seed except cotton seed; (5) cotton seed shown by affidavit to have been sacked continuously for nine months or more; (6) cotton seed for planting purposes only, after fumigating with carbon bisulphide by competent entomologist; (7) hay; (8) empty freight cars.

VAYSSIÈRE (P.). **Cochenilles nouvelles de l'Afrique française** [New Coccids from French Africa.]—*Rev. Phytopath. appliquée, Paris*, i, no. 9, 5th Oct. 1913, p. 124.

A short description is given of *Mytilaspis coccomytibus dispar*, ssp. nov. and *Diaspis taxicola*, sp. nov. The former was found in large numbers on a branch of manioc in Madagascar, while the latter was collected on *Taxus baccata* in the Atlas of Blidah (Algeria).

CHITTENDEN (F. H.). **The Florida Fern Caterpillar.**—*U.S. Dept. Agric., Bur. Entom. Washington, Bull.* 125, 29th Oct. 1913, 11 pp., 1 fig.

The fern caterpillar, *Eriopus floridensis*, is a native of Florida and tropical America, but is extending north, causing damage in greenhouses in Columbia, Illinois, and Ohio. It has also been reported in Mexico, Guatemala, Costa Rica, the Bahamas, Jamaica, Cuba, Haiti, St. Lucia, St. Vincent, Venezuela, British Guiana, Brazil, and Trinidad. It is restricted to ferns, and appears to destroy more than it requires for food, cutting plants entirely bare and attacking each new leaf as it appears. Though not strictly a nocturnal feeder, it shuns bright light, and is most often found feeding exposed in early morning. Treatment of this pest is not easy. In one case a spray of a strong decoction of hellebore was used; this scalded the foliage, causing many plants to die. A bait of poisoned bran and molasses was tried, but the caterpillars preferred the ferns. Fumigation with carbon bisulphide was of no avail. Lead arsenate when used in a solution strong enough to kill the caterpillars is said to leave a white deposit, which destroys the commercial value of the fern. A spray of Paris green, strong enough to kill the caterpillars, burns the foliage. Paris green properly mixed with Bordeaux mixture should not produce this effect. Hydrocyanic-acid gas fumigation is also suggested for use when the eggs are hatching and during moults. It seems that hand-picking, though laborious, is most successful, one of the best methods consisting in shaking the plants over the ground and trampling on the caterpillars as they fall. *Ichneumon extrematis*, Cress., *Sagaritis* sp., and a Tachinid fly have been observed attacking this caterpillar.

PARKER (W.). **A sealed Paper Carton to protect Cereals from insect attack.**—*U.S. Dept. Agric., Washington, Bull.* 15, 16th Oct. 1913, 8 pp. 8 figs.

The injury done by insects to packed cereals causes a financial loss much greater than most millers suppose. Examination of infested packages showed that infestation usually commenced where there was a hole in the package; carefully sealed packages appeared intact. The more important insects attacking stored cereal products are the Indian-meal moth (*Plodia interpunctella*, Hübn), the Mediterranean flour moth (*Ephestia kuehniella*, Zell.), the meal snout-moth (*Pyralis farinalis*, L.), the saw-toothed grain beetle (*Silvanus surinamensis*, L.), the confused flour beetle (*Tribolium confusum*, Duv.), the granary weevil (*Calandra granaria*, L.), and the rice weevil (*C. oryzae*, L.). The cereal is sterilised prior to being packed, and when insects are found in packages, the eggs, larvae, or adults have gained access to the cereal after, or shortly before, the cereal was packed. In an experiment to test the efficiency of a cheap sealed carton, a cereal was sterilised and placed in sterilised packages. Had any insects or eggs been in the packet, the temperature of 180° F. used for sterilisation of the cereal would, undoubtedly, have killed them. The packages were closed by glueing the ends, but some were covered with label paper, so that there were no openings. Some labelled and some unlabelled packages were placed in boxes with flour badly infested by the confused flour beetle. Tables of the results of the experiment show the label to be efficient in preventing insects entering the cartons. Infestation may take place in the cereal elevator leading from the steriliser to the packing room or in the grocer's storeroom. In drying non-flaky cereals a sterile chute with baffles, through which hot dry air is blown, would be effective. In the case of flaky cereals, a belt-elevator is necessary, but this can be inclosed and the hot air used as before. Both elevators should be so constructed, that they can be readily sterilised with air at a temperature above 180° F. The sealed carton may be made of a stiff cardboard. The printed label should be of three pieces, two ends which lap over the edges and extend down the side, and a side piece. Care must be taken to seal the ends of the carton properly before applying the label. Another package has been suggested, namely, the placing of a sealed paper bag inside an ordinary carton. This has proved to be no better than the old-style packages. In a large flour mill in California, 160 lb. steam is used as a source of heat, and a carrier eight feet long, with its load of cereal, can be heated to 180° F. in two minutes, by this means, without difficulty.

CHITTENDEN (F. H.). **The Rose Slug-Caterpillar.**—*U.S. Dept. Agric., Bur. Entom., Washington, Bull.* 124, 31st Oct. 1913, 9 pp. 1 fig.

It is only within comparatively recent years that the slug-like caterpillar, *Euclea indetermina*, Boisd., has been known to injure the rose, though the larvae appear to have been known since 1797. Synonyms of *E. indetermina* are *Callochroa viridis*, Reak., *C. vernata*, Pack., and *Parsa chloris*, Grote. It is not a common species, and as it is of interest to rose-growers and to nurserymen, the author gives illustrations and a brief description of it. The larva has been observed

on *Rosa* spp., *Prunus* spp., *Quercus* spp., *Castanea dentata*, *Carya* spp., *Asimina triloba*, *Myrica cerifera*, *Cornus florida*, plum, apple and pear. It feeds on the edges of the leaves. The eggs, which are deposited on the underside of the leaf, hatch after about nine days. The larvae mature about the middle of September, passing through eight or nine stages, and have stinging spines. If only a few rose-bushes or young trees are attacked, handpicking will control this insect, precaution being taken to use a glove. A spray of Paris green or arsenate of lead may be applied.

HUARD (V. A.). **Rapport de l'entomologiste du Ministère de l'Agriculture de la Province de Quebec pour l'année 1912-13.** [Report of the Entomologist of the Ministry of Agriculture of the Province of Quebec for the year 1912-1913.]—*Quebec*, 24th Oct. 1913, 15 pp., 5 figs.

The tent-caterpillars were the most important pests of the year. *Malacosoma americana*, F., chiefly attacks orchards and *M. disstria*, Hb., forests. The larvae of both soon strip a tree of its leaves. While it is evidently impracticable to prevent this destruction in the case of forest trees, damage in orchards can be almost entirely prevented. The eggs are easily seen on the bare branches in winter, and nearly all may be collected and burnt. Speaking generally, all insectivorous birds should be protected. The services of a sparrow are valued at 12 shillings a year in France, and must be worth more in the Province of Quebec. Banding is useful. Where the caterpillars emerge in the tent they may be taken and burnt, or a petrol torch may be used. Spraying the infested parts will destroy those caterpillars which have just hatched out. The spray is made up of 1 lb. Paris green in 160 gals. water, or 2 lb. arsenate of lead in 40 gals. of water.

In 1913 the San José Scale was observed for the first time in the Province on a young service tree, which was destroyed without delay. The woolly aphis *Eriosoma* (*Schizoneura*) *lanigerum* was observed in three places, but only a few trees were infested and instructions were given for the affected branches to be burnt. In a garden at Montcalmville, near Quebec, the Oyster-Shell Bark-Louse (*Mytilaspis pomorum*) was observed. The New York Plum Scale (*Lecanium prunastri*) was reported to be present in orchards of the county of Islet. In conclusion, the author suggests provincial legislation on three points: (1) To require an annual inspection by the Entomological Bureau of the Ministry of Agriculture of all those nurseries in the Province which deal in plants and fruits; (2) to give the inspector power to destroy plants infested by dangerous diseases or to order suitable treatment; (3) to forbid nurserymen to distribute their products unless they hold the current year's certificate from the Entomologist certifying that their nurseries are free from parasitic disease or insect pests.

KING (H. H.). **On the use of Poison in the Control of Locusts in the Anglo-Egyptian Sudan.**—*Cairo Scientific Jl., Alexandria*, vii, no. 86, Nov. 1913, pp. 251-254.

The species of migratory locust most common in the Anglo-Egyptian Sudan is *Acridium* (*Schistocerca*) *peregrinum*, Oliv. The young locusts

appear after rain, and feed during the morning and evening. The methods of controlling locusts which have been adopted in the Sudan include the following: (1) Collection and destruction of eggs and hoppers; these methods need a large amount of labour and the collecting of eggs may be exceedingly arduous; (2) scaring away of adults by noises; (3) the use of bacteria, as *Coccobacillus acridiorum*, d'Herelle, and the locust fungus, *Empusa grylli*; these have proved of little help in the control of locusts.

During 1907, the author tested various other methods, among them poisoned bait. This bait consisted of fresh, green grass, finely chopped and soaked in a solution of 1 lb. arsenite of soda and 4–11 lb. treacle in 12 gallons water. This bait was scattered thinly either in front of the swarm while it was moving and feeding or under the shrubs in which the hoppers were roosting. The bait was readily devoured when the treacle was present in the proportion of 4 lb. to 12 gallons of water, but the hoppers were attracted still more when the proportion of the treacle was increased. A swarm fed with poisoned bait at about 7 a.m. would all be dead the following morning. Animals were not allowed to graze over the area treated for six days. The use of arsenite of soda in the control of locusts saves an enormous amount of labour, and the entire swarm is destroyed. The risk to cattle and other grazing animals, with ordinary precautions, is infinitesimal.

KERSHAW (J. C.). **Recommendations for dealing with the Froghopper.** *Dept. Agric. Trinidad and Tabago, Special Circ.* no. 9, 1st Dec. 1913, 10 pp.

Under artificial conditions the vermilion egg-parasite, *Oligosita giraulti*, Cwf., parasitised 5 to 6 per cent. of froghopper eggs. After careful examination the author concludes that in nature the percentage is between 5 and 10 per cent. in the most favourable localities, with an average below 5 per cent. This parasite is, therefore, not worth consideration, and former recommendations for dealing with trash with regard to it are cancelled.

The Syrphid fly [*Salpingogaster nigra*, Schiner] is the chief check on the multiplication of the froghopper in Trinidad. Unfortunately, it usually appears in numbers only on the later broods. Its larvae are very voracious, and in most localities nymphs are scarce after the wet season, and the Syrphid larvae will probably either starve or destroy one another. Many female froghopper adults escape all enemies, and produce the early broods in the ensuing season, when there are but few Syrphids about. The author thinks it would be well worth trying to breed the Syrphid on through the dry season, in order to have a supply ready to distribute on any well-marked early broods of froghoppers. About 300 nymphs per day are required to feed 100 Syrphid larvae, but nymphs of *Tomaspis pubescens* can be procured in the dry season, and a supply of the Syrphid could be kept up in a large cage or enclosure, preferably erected over a channel or drain with suitable grass already growing there. A light rough construction would serve the purpose. The Syrphid will copulate and breed in a large and suitable cage. Then a few adult Syrphids and a few maggots could be liberated on early froghopper broods, wherever they occurred in numbers.

The author is not in favour of destroying the nymphs by ramming but highly approves of early broods being collected by hand. The crushing of adults of early broods in young cane by squeezing the leaf sheaths where they congregate is also recommended. Possibly this plan would be even more effective than using the kerosene-lysol emulsion, but every efficient method should be used against the early broods, because it is impossible to do much against the enormous later ones. All abandoned land and grass fields near cane should be grazed or put under cover crops. The cattle disturb the froghopper so much that it avoids these fields. Cutting the grass is useless. Regarding cane-trash, the author now thinks it probable that (where trash cannot be removed to the cattle pens) the best plan would be to keep it in a few large piles (boucans), rather than long beds between the rows of cane, provided that these boucans could be turned right over, and the nymphs below destroyed. As regards the destruction of adult froghoppers, trap lights are about the only method at present of any value at all, when the insects appear in great swarms. The following catches were made on badly "blighted" fields during September 1913: Night of 5th September, 24 lamps, 56,900 froghoppers; 10th September, 12 lamps, 23,420; 21st September, 72 lamps, 58,363. These were only the largest of many catches at lights. The hurricane lamps were placed about 20 to 25 feet apart, *i.e.*, one opposite the end of each cane bed along the trace, and stood in trays about 2 feet square, with a ledge to retain the water and film of kerosene, or a mess of molasses. They should also be placed where there is any open space among the canes.

Summarised briefly, the author's recommendations are:—(1) That a search be made for an efficient egg- or adult-parasite of the froghopper, though it is very unlikely that any will be procured in islands near Trinidad, or any adjacent part of the mainland; (2) that meanwhile every effort should be made to get the Syrphid on the early broods of froghopper; (3) abandoned lands adjacent to cane-fields to be either put under a cover crop or grazed; grass "traces" to be hoed and the rubbish taken to the cattle pens, especially just before the wet season; (4) all trash should be removed to the pens, and not returned to the fields till well broken up and sodden, and especially the trash of the two or three rows of cane nearest to traces or grass land just before the wet season; (5) after the appearance of early broods of froghopper nymphs they should be destroyed by kerosene-lysol emulsion or by squeezing the leaf-sheaths, whichever proves the quicker and more effective; (6) the later large swarms of adults should be destroyed as far as possible by trap-lights.

A grasshopper (*Xiphidium* sp.) is very common in grass lands, and destroys froghoppers along with other insects. It is considered to be *X. varipenne*. Next to the Syrphid, however, the author holds spiders to be the most effective natural enemies of the froghopper.

GUPPY (P. L.). **Life-history of the Syrphid fly predaceous on Froghopper Nymphs.**—*Bull. Dept. Agric., Trinidad and Tobago*, xii, no. 75, Nov. 1913, pp. 159-161.

From 30 to 40 nymphs are killed and sucked during the life of a larva of this fly [*Salpingogaster nigra*, Schiner], which is from nine to

n days' duration, and no doubt it destroys numbers of very small nymphs wherever these are abundant. In two instances adult froghoppers were found killed by the maggot, which had attacked them when they had just issued from the last nymphal instar and were too soft to escape from surrounding froth. Besides the nymphs of *Tomaspis saccharina* (the sugar-cane froghopper) it kills those of *T. pubescens* (the black froghopper). It travels from froth to froth fairly rapidly, and is able to follow the nymphs under the soil. The fly itself resembles very closely a small black wasp with some yellow markings on the thorax and abdomen. Even when the fly is settled, it continues to move its abdomen in and out, just as a wasp does. This fly is one of the most important enemies of the froghopper. It is hoped to breed it successfully on a large scale so as to get it started earlier in the season.

CIMATTI (V.). **Per la difesa dei nostri agrumi.** [The protection of our citrus fruits.]—*Rivista di Agricoltura, Parma*, xix, no. 49, 5th Dec. 1913, pp. 782-784.

In 1910, Italy sustained a loss of about £40,000,000 through insect pests. A most dangerous one, which threatens to spread among the citrus plants, is *Chrysomphalus dictyospermi* var. *pinnulifera* (bianca-rossa). Lime-sulphur is useful for its control, and some of the conclusions arrived at by Martelli after long and repeated experiments with this insecticide are: The purity of the lime is of prime importance. The lime must contain 90 per cent. of calcium oxide, and in the 10 per cent. of impurity the magnesium oxide must not exceed 5 per cent. The sulphur must be of a very high degree of purity (98 per cent.), and in almost impalpable powder.

The larvae of *Prays citri*, Mil. (tignuola, zagara) ruins the orange blossoms. The following spray formula is given: 20 gals. water, 22 lb. molasses, 22 lb. dregs of lime juice essence, and 2 gals. water in which 4½ lb. of sodium arsenite have been dissolved. Spray in May, repeat 10 days later; then apply again in June and repeat as before. Another pest of citrus plants, *Pseudococcus citri*, Risso, causes the white mould (muffa bianca or cutuneddu), which is nearly always accompanied by fumaggine. The following emulsion is suggested: 6 lb. soap (soft or hard), 1½ pts. petroleum, 20 gals. water. It should be applied, as usual, in June.

CHITTENDEN (F. J.). **On Beans damaged by Beetles.**—*Jl. R. Hort. Soc., London*, xxxix, pt. 2, Dec. 1913, pp. 379-380.

In some seasons a considerable proportion of the seed of broad-beans offered for sale is found to be damaged by a boring beetle, *Bruchus rufimanus*, Boh., often wrongly called the bean weevil. The question arises whether the damaged seeds may be sown with a prospect of reaping a crop. As it would be manifestly unwise to sow the beetles as well as the seeds, it is recommended first of all to destroy the beetles in the seed by fumigating with carbon bisulphide (3 lb. to 1,000 cubic feet of space) for 48 hours. Experiments have shown that seeds thus treated have produced plants as strong and as healthy as those from

undamaged seeds. The beetle instinctively avoids the radicle and plumule when boring, confining its attention to the food-stuff stored in the cotyledon, and of this there is a store great enough to satisfy the plant after the ravages made by the beetle. The only danger is that if the weather be cold and the seed long in germinating, there is a possibility of decay setting in, for bacteria or fungi would have easy access through the wounded testa.

WÜNN (H.). **Im Unterelsass und in der angrenzenden Rheinpfalz festgestellte Cocciden.** [Coccids recorded from Lower Alsace and the adjoining Rhine Palatinate.] *Zeit. wissen. Insektenbiol., Berlin*, ix, nos. 8-9, 1st Sept. 1913, pp. 255-258.

This is a list of all the species of COCCIDAE, known from the area indicated, and with each species is given a very full record of the localities in which it has been found, and all the plants on which it has occurred. The list is being published in instalments.

The Fertilisation of Cacao. *Gardens Bulletin, Straits Settlement, Singapore*, i, no. 6, 15th Dec. 1913, p. 195.

The number of cacao pods formed on a tree is very much out of proportion to the number of flowers produced. Mr. G. A. Jones, who has experimented to find the reason of this, has noticed that if the common red ants which tend green fly about the flowers are kept away, no pollination results. There is, however, no positive evidence to show that red ants have anything to do with the fertility of the flowers.

BURKILL (I. H.). *Clerome gracilis*, **a Butterfly destructive to Palms.**—*Gardens Bulletin, Straits Settlements, Singapore*, i, no. 6, 15th Dec. 1913, pp. 188-186.

The caterpillar of *Clerome gracilis*, Butl. (AMATHUSIINAE) is social in its habits, and has been found to damage *Rhopaloblaste* palms. The caterpillars, when both feeding and resting, are found on the under surface of the leaf, feeding only at night.

BURKILL (I. H.). **The Coconut Beetles,** *Oryctes rhinoceros* **and** *Rhynchophorus ferrugineus*.—*Gardens Bulletin, Straits Settlements, Singapore*, i, no. 6, 15th Dec. 1913, pp. 176-188.

The two beetles legislated against in the Straits Settlements are *Oryctes rhinoceros* and *Rhynchophorus ferrugineus*. The first is the commoner, but individually less destructive; it feeds as an adult in the stems of living palms, generally coconut palms, tunnelling into the softer parts of the stem; it may lay its eggs in these tunnels, but usually it does so in decaying vegetable matter, sawdust, etc., and especially in the central parts of dead palm trunks. The Palm Weevil (*R. ferrugineus*) lays its eggs on the coconut trees, making a small hole for each egg with its long snout. The burrows of the Rhinoceros Beetle (*O. rhinoceros*) give the Palm Weevil access to the inside of the palm, of which full advantage is usually taken. The eggs give rise to

white grubs, which eat out galleries through the softest tissue, thereby destroying the heart of the palm cabbage.

The Rhinoceros Beetle is common from India to the Philippine Islands, wherever large palms abound. In Africa its place is taken by *O. monoceros* and *O. boas*, which attack palms in the same way. In Madagascar are six other species of palm-attacking *Oryctes*. In the Island of Reunion there are two species. Tropical America has a closely allied genus, *Strategus*, which furnishes at least one species of similar habits. Allied genera, *Pimelopus* and *Scapanes* in New Guinea, and *Camelonotus* in America, attack young palms, burrowing into their stems from the ground. The Palm Weevil of Asia, occurs in India, Ceylon, and eastward to the Philippine Islands. It is replaced by *R. phoenicis* in tropical Africa, and by the allied *R. palmarum* and *R. cruentatus* in tropical America.

As to the extent of the damage done by the Rhinoceros Beetle in Samoa, about the beginning of 1912, an official statement was made that 150 trees had been destroyed and 6,000 to 8,000, or one-fifth of the others in affected areas, had received damage enough to postpone their yielding for one or two years. Measures taken to cope with the beetle consisted of collecting the grubs, and trapping the beetle in holes dug in the ground and filled with material such as rotting stumps, which afford suitable breeding places for the insect; the traps were visited periodically and the beetles killed by suffocation with carbon bisulphide. These methods were, however, expensive. The method adopted now against both the Rhinoceros Beetle and the Palm Weevil consists in removing every kind of material from the plantation which would offer a suitable breeding place for the beetles not only palm stumps, but also all sorts of decaying vegetation, etc. For the removal of dead trees and stumps the author advocates the use of explosives. Experiments made to find the quantity of explosive necessary to destroy trees and stumps showed that to blow a stump completely to pieces, four cartridges of blasting gelatine, placed in a hole drilled in the base of the stump, were sufficient; four cartridges of blasting gelatine similarly placed in the base of a standing dead tree and exploded, brought it down, leaving in the ground insufficient material to serve as a breeding place for the beetle; four cartridges of gelignite did not suffice to do the work thoroughly, nor were three cartridges of blasting gelatine quite sufficient.

The following palms are recorded as attacked by the Rhinoceros Beetle:—*Cocos nucifera* (Coconut), *C. plumosa*, *Martinezia caryotaefolia*, *Phoenix dactylifera* (date palm), *P. sylvestris*, *Livistona chinensis*, *Verschaffeltia splendida*, *Dictyosperma album*, *Hyophorbe amaricaulus*, *Elaeis guineensis* (African oil palm), *Corypha umbraculifera* (Talipot palm), *C. gebanga*, and *Borassus flabelliformis*. The following are recorded as attacked by the Palm Weevil:—*Oreodoxa regia* (Royal palm) *Borassus flabelliformis*, *Phoenix sylvestris*, and the author has found it on *Arenga saccharifera* and *Elaeis guineensis*.

The following papers containing detailed accounts of the life-history, habits and methods of combating these beetles are referred to:—Gehrmann, in Der Tropenpflanzer, xv (1911) pp. 92; Friederichs, K., in the same, xvii (1913) pp. 538 [see this *Review*, Ser. A., ii, p. 26]; Jepson, F. J., Bull. No. 3, Dept. Agric., Fiji. (1912); Preuss, Der Tropenpflanzer, xv (1911), p. 73; McKenna, J., and Shroff, K. D.,

Bull. No. 4, Dept. Agric., Burma (1910), p. 3; Ridley, Rept. on the Destruction of Cocoanut Palms by Beetles, Journ. Asiatic Soc., Straits Branch, No. 20 (1889); Beven, Trop. Agric., N.S., xxiv, May 1905, p. 111; Koningsberger, J. C., Mededeelinger van Slands Plantentuin, xxii (1898), p. 42; Summers, Canadian Entomologist, v, p. 123; Blanford, Kew Bull., 1893, p. 37; Ghosh, C. C., Mem. Dept. Agric. India, Calcutta, ii, No. 10, Dec. 1911.

KEMNER (A.). **Vara Clerider, deras levnadssätt och larver.** [Our Cleridae, their habits and larvae.]—*Ent. Tidskrift, Uppsala*, xxxiv, 4th Dec. 1913, pp. 191-210, 12 figs.

The author gives an account of the following Clerid beetles from Sweden: *Thanasimus formicarius*, L., *Corynetes coeruleus*, De Geer, *Opilo mollis*, L., *O. domesticus*, Sturm, *Tillus elongatus*, L., and *Necrobia violacea*, L. The larvae of these species are described and a key to them is given with figures of the posterior extremities.

The following additions are made to our knowledge of their biology. The larva of *Thanasimus formicarius* is abundant in the galleries of *Myelophilus piniperda*, L., and *Ips typographus*, L. Young larvae occur in June and pupation takes place in August September, but many hibernate. The Clerid larvae prey on those of the Scolytid beetles. The larva of *Opilo domesticus* was found in wood in the Royal castle of Kalmar in the galleries of *Anobium striatum* on the larvae of which it preys. The small heaps of frass observed on the surface of timber and furniture attacked by *Anobium* are, as a matter of fact, not made by *Anobium*, but by the larvae of *Opilo*; as this larva itself is able to make galleries in the timber it cannot be regarded as wholly beneficial; it is, however, very predaceous, as the great number of empty skins of *Anobium* larvae to be found in the galleries bear witness.

The larva of *Corynetes coeruleus*, a species which Thomson believed to have been imported at Gottenborg, but which now is not uncommon in the southern and central parts of Sweden, was also found on the same occasion preying on the larvae of *Anobium*. As this larva is of smaller size than that of *Opilo domesticus*, it can hunt the larvae of *Anobium* without making any galleries itself, and is therefore presumably more beneficial than the former, but on account of its comparative scarcity its controlling influence is not important in Sweden.

Necrobia violacea hibernates as an imago, and its larva is found on carcases, feeding on other larvae.

SAHLBERG (J.). **Till kännedomen om *Haltica engströmi* och dess biologi.** [A contribution to our knowledge of *Haltica engstroemi* and its biology.]—*Ent. Tidskrift, Uppsala*, xxxiv, 4th Dec. 1913, pp. 261-270, 1 pl.

This beetle was described by Sahlberg as far back as 1893, but only provisionally, as only females were found. Subsequently, it was discovered in two different localities in N. Russia, and during recent years again in Finland, the last time near Gammelstad on *Spiraea ulmaria*, leaves of which were riddled with holes, sometimes only the

principal veins being left. From the last-named locality it has spread further each year.

Sahlberg concludes that the species is an immigrant from the east, and that it will continue to spread westwards, and eventually reach Sweden. He succeeded in finding the larva, which, in July, lives in the same manner as the adult does in spring and autumn. A detailed diagnosis and figures of the larva, male, female, and an attacked leaf are given.

Gas Tar and Mealy Bug. *Gardener's Chronicle, London*, liv, nos. 1399, 1401, 1407, 1409, 18th Oct., 1st Nov., 6th Dec., 13th Dec. 1913, pp. 279, 309, 407, 427.

Readers of the "Gardener's Chronicle" have communicated the results of their experiences with gas tar as a means of combating the mealy bug (*Pseudococcus citri*) on vines. Mr. A. Shakelton, Chard, says that he found a mixture of 6 to 9 parts of clay and one part of gas tar to do as much injury to the vines as to the pest: he obtained good results by the use of Gishurst compound. Mr. J. Whytock upholds the use of a mixture of clay and tar, finding that it destroys the pest without injuring the vines; the varieties of vine grown by him were Mrs. Pince, Lady Hutt, Gus. Colman, and Appley Towers. Mr. Singleton Oxfordshire, says that the use of a mixture of gas tar and clay in the above proportions caused complete failure of the crop of Black Hamburgh grapes, but he used it successfully in the case of varieties such as Lady Downes and Black Alicante. "J. H. Y." gave up the use of all such methods as painting with tar in favour of fumigation with hydrocyanic acid, which, according to him, is entirely satisfactory, completely killing the pest without injury to the vine or any other plant in the house (except *Tradescantia*). He also found the gas equally successful in killing brown scale (*Lecanium persicae*, Geoff.) on peach trees.

Glaser (R. W.) and Chapman (J. W.). **The Wilt Disease of Gipsy Moth Caterpillars.**—*Jl. Econ. Entom., Concord*, vi, no. 6, Dec. 1913, pp. 479-488.

In August 1912, the authors published a paper in *Science* entitled: "Studies on the Wilt Disease or Flacherie of the Gipsy Moth." [See also this *Review*, Ser. A. i, pp. 33-36.] More extensive observations and experiments conducted during the past year have led them to modify some of their original views concerning this disease. The conclusions drawn from the first series of observations concerning the mode of infection and general pathology were, on the whole, correct, but the etiological connection of a micrococcus with the disease was not so well grounded. The micrococcus described in 1912, and believed to be connected with the wilt disease, has proved to be a casual intestinal parasite. The reason for eliminating this organism (*Gyrococcus flaccidifex*) from the possible excitors of the disease are the following: If smears were made from caterpillars dead but a short time, no bacteria could be found. Cultures made from such cater-

pillars on caterpillar and other nutrient media remained sterile. If serial sections are made of diseased caterpillars obtained in the field, polyhedral bodies will be found in abundance, but no bacteria in the tissues, and usually the intestinal lumen will be free from micro-organisms in general.

Great care was taken to procure healthy uninfected caterpillars for the experiments, by collecting from localities where no epidemic was evident. The caterpillars were divided into groups, and each group was subjected to slightly different conditions of temperature, light, moisture, etc. This gave the disease, if latent, every chance of becoming manifest, since conditions unfavourable to the caterpillars are believed to assist its development. If the disease under one or other of the conditions broke out, the whole of the caterpillars collected from the same locality were discarded. Such a method of obtaining healthy individuals is much more satisfactory than the blood test, as the controls showed.

Many views have been held regarding the agents responsible for the disease. Escherich and Miyajima in 1911 were of the opinion that the polyhedral bodies were the carriers of the virus; Bolle believed that a Microsporidian (*Microsporidium bombycis*) was responsible. According to Knoch, little refractive granules appear in the blood corpuscules; these multiply and infect the nuclei of tissue cells, where their amoeboid membrane hardens and they change into polyhedral bodies; he further states that the minute granules, which resemble the Chlamydozoa of Prowazek, are the vegetative, the polyhedral bodies the resting stages of the causative organism. Prowazek was able to infect caterpillars with the disease by means of a filtrate of emulsified diseased material, which contained neither bacteria nor polyhedral bodies; his experiments, in the author's opinion, are suggestive, but not conclusive, as no controls were made, and the blood test was the only one used in diagnosing the health of the caterpillars.

Thirty filterable viruses are known to be responsible for diseases in man and the lower mammals, but only one has been described in insects, viz., that of sacbrood, a bee disease discovered by White in 1913. [See this *Review*, Ser. A, i, p. 186.]

Coming to the experiments made by the authors, it is first stated that the reason why filtrates of diseased material gave negative results in 1912, was that the emulsion was too concentrated. This year, caterpillars which died of the disease were crushed with just enough sterile water to facilitate the crushing. This material was then strained through cheese-cloth and filtered by means of suction through filter paper; the filtrate was diluted in one case with fifty, in another with twenty-five times its volume of water. This was then passed through a Berkefeld "Grade N" filter and used for the infection experiments. The filtrate was free from bacteria and polyhedral bodies. Nothing could be observed except some very minute dancing granules, also noticed by Prowazek in his experiments with silkworms. A large number of caterpillars were fed with the Berkefeld filtrate smeared on red oak leaves. In one series of experiments 50 caterpillars were fed with the filtrate, in another 40, in a third 20. The same number was fed with material before it was passed through the Berkefeld filter, and a large set of controls, fed with Berkefeld filtrate which had been sterilised by autoclaving, accompanied each series.

Out of the entire lot of caterpillars (110) fed with unsterilised Berkefeld filtrate, 28 died with typical wilt symptoms. Polyhedral bodies were abundant, but there were no bacteria. Other caterpillars died from other causes: the caterpillars dying thus differed from those dying of wilt disease in being tough instead of flaccid, and in the absence in them of polyhedral bodies. Some of the caterpillars were killed by the Tachinid parasite, *Compsilura concinnata*. A greater number of caterpillars (48 out of 85) died in the experiments with the unfiltered virus. This seems to show that the virus is filterable, but with difficulty. Among the entire number of controls, 162 caterpillars, only three died of wilt, equivalent to about 1·8 per cent., a very small percentage, which can be overlooked as an experimental error.

The polyhedral bodies have as yet revealed nothing of a parasitic nature; they may be a resting stage of a filterable vegetative form, but the authors are rather inclined to regard them as reaction bodies. They are possibly products of nuclear digestion, produced by the virus invading the nuclei and digesting the chromatin.

One more matter is considered, viz., the question as to whether the disease is carried by the air, as is held to be the case by W. Reiff. Details are given of the experiments carried out to test this view, and the conclusion is that the wind is not an important factor in transporting the disease, and that infection in nature occurs when caterpillars feed on leaves soiled by the juices of dead individuals.

A striking phenomenon observed in all the experiments was the large number of moths obtained from caterpillars which had been repeatedly infected. This seems to suggest a degree of immunity possessed by some of the caterpillars, and agrees with the observations in the field, where, in a given locality, the disease raged for several weeks, and yet moths were seen later in abundance.

Gough (L. H.). **The Fumigation Campaign of 1912-1913.**—*Agric. Jl. of Egypt, Cairo*, iii, part 1, 1913, pp. 38-41.

The fumigation with hydrocyanic acid gas in Egypt of citrus trees affected with scale-insects was commenced by the Department of Agriculture in January 1912. Two gardens containing about 3,000 small trees were fumigated with satisfactory results. For the fumigation campaign of 1913–1914, the equipment consisted of seventy-two fumigation sheets, of which thirty were 20 feet in diameter, thirty 34 feet in diameter, and twelve 45 feet in diameter. These, except five of the largest, had been made at Cawnpore to the pattern given in Mr. Woglum's paper (Fumigation of Citrus trees, U.S. Bureau of Entomology, Bull. 90). The cloth used was 7½ oz. drill; the dosage was calculated from the tables given in that paper, one ounce charges being given in every case to allow for the loose texture of the cloth. A start was made in October 1912, in the garden of H.H. the Khedive, at Kubba, the fumigation campaign being carried out by the staff, consisting of a European Inspector, and at first seven, but generally two, students. The tallest trees fumigated were 23 feet high, those taller being usually too old to be profitable. The balance sheet showed a small loss.

The scale-insect (*Aspidiotus aonidum*, L.), which does the damage in Egypt, is a recent introduction, and the depreciation it causes may be 50 or 60 per cent. The improvement due to fumigation pays for itself in the first season and leaves an additional profit over and above last year's takings.

WILLIAMS (C. B.). **On two new species of Thysanoptera from the West Indies.** —*Jl. Econ. Biol., London*, viii, no. 4, 16th Dec. 1913, pp. 209-215, 2 figs.

Two collections of Thrips were received by the author from Mr. F. Birkinshaw, of the Agricultural Experiment Station, Kingstown, St. Vincent. The insects had been taken in the grounds of that station on cacao and bitter cassava (*Manihot utilissima*). It was stated that the manihot leaves were injured somewhat and consequently did not develop properly; the insects however, did not appear to be a source of great injury so far as the yield is concerned, unless it was present in large numbers. The collection of insects taken on cacao consisted entirely of larvae and adults of *Heliothrips rubrocincta*, Giard; that from cassava contained two species, both of which appear to be new. One belongs to the genus *Frankliniella*, and has been called *F. melanommatus*; for the other it has been found necessary to erect a new genus of the family THRIPIDAE, and the name *Corynothrips stenopterus* is proposed for it.

THOMPSON (W. R.). **La Spécificité des Parasites entomophages.** [Specialisation of habit in Parasites of Insects.]—*C. R. de la Soc. Biol.*, lxxv, no. 36, 19th Dec. 1913, pp. 559-560.

In a second communication upon this subject [see this *Review*, Ser. A, ii, p. 16], the author describes experiments he made with the Tachinid parasite *Sturmia scutellata*, R.D., supplied with eggs of *Lymantria dispar*, *Clisiocampa disstria*, *C. americana*, *Vanessa antiopa*, *Hemerocampa leucostigma*, and *Orgyia antiqua*. In the first three the parasites developed normally; they did not develop at all in *Vanessa*. In the last two, although the eggs were given in large numbers, not a single perfect larva was obtained; upon dissection, 44 larvae of the parasite were found, but of these only one had grown, and instead of being as usual in the muscles of the host larva, they were free in the general body cavity, and were much smaller than is usual with larvae at that age. Besides these, 42 larvae were found dead and decomposing and surrounded by phagocytes.

It is evident that *Sturmia scutellata* cannot live and develop in surroundings other than those furnished by such hosts as *L. dispar* or *C. disstria* and *americana*. *L. dispar* belongs to the LYMANTRIIDAE, whereas *C. disstria* and *C. americana* belong to the LASIOCAMPIDAE; there is not, therefore, necessarily any relation between the taxonomic position of Lepidoptera and their special parasites. On the other hand, different parasites can often live in a limited number of hosts under the action of certain ethological factors that are at present difficult to determine.

GOWDEY (C. C.). **A List of Uganda Coccidae and their Food-plants.**—*Bull. Entom. Research, London*, iv, pt. 3, Nov. 1913, pp. 247-249.

The list which the author gives of the COCCIDAE of Uganda is the result of an extended search among the flora of that country. Owing to the favourable climatic conditions and the luxuriance of vegetation, Coccids continue to grow and multiply throughout the year. The family is abundantly represented, no less than 49 species being enumerated.

DUDGEON (G. C.). **A Proposed Method of Controlling the Ravages of Leaf-eating Caterpillars.**—*Bull. Entom. Research, London*, iv, pt. 3, Nov. 1913, pp. 243-245.

In Egypt, where temperature and humidity exhibit practically no variation which can seriously affect agriculture, and where the land is irrigated by a well organised system of canals, which serve also to fertilise the soil, almost the only uncertain factor which may affect results is the presence or absence of insect pests. The isolated position of Egypt with respect to other countries makes it less liable to the introduction of pests, but on the other hand, when a pest has gained a foothold, it remains unattacked by natural enemies, which in less isolated countries would tend to exterminate it. The present paper deals with the so-called "cotton worm," the caterpillar of *Prodenia litura*, F., a Noctuid moth of the sub-family ACRONYCTINAE. Previous to 1910, the Government had legislated against this pest, but the methods employed were purely mechanical, consisting of destroying the egg-masses as soon as they appeared; other methods employed were equally costly and less efficacious. In 1910, upon the formation of the Agricultural Department of Egypt, attention was turned to the possibility of introducing disease among the larvae. Experiments were made in which bodies carrying diseases known to attack lepidopterous insects were introduced and the larvae of *P. litura* were infected with them. Muscardine and other fungoid diseases were found unsuitable, owing to the dryness of the climate. Pebrine and flacherie were tried, but it was impossible to say what the results were, as a superinfection occurred due to a protozoan disease known as "grasserie" (*Microsporidium polyedricum*, Bolle). This disease was so efficacious that all the larvae of *Prodenia* in the experimental area were killed. A month later it was found difficult to procure *Prodenia* uninfected by the disease from any part of the country. The author believes that the outbreak was spontaneous, and that it had nothing to do with the laboratory experiments. Steps were taken to secure the continuity of the disease. In experiments to find out how this might best be accomplished, 30,000 silkworms were fed with food sprayed with water in which were the macerated remains of an infected silkworm. They all died before reaching maturity, mostly on or shortly after the fourth day. A similar experiment was made, using an infected cotton worm instead of a silkworm; the worms did not die so quickly, but no larva reached the spinning stage. Later, in May 1913, cotton worms were infected by food sprayed with water containing a single macerated diseased silkworm; in three days 50 per cent. had succumbed, only six survived to pupate, and it was not expected that these would emerge.

As the cotton worms in the field were rare, it was not possible to test these experiments on a large scale in the open. The method that would be adopted in the open would be to disseminate the disease by artificial spraying of the plants with water containing infected larvae. Investigations were, at the time of writing, not sufficiently complete to make it possible to say what the effect of climate would be on the infective power of the disease, but there is no doubt that the rainless climate of Egypt would facilitate its dissemination by spraying.

PEACOCK (A. D.). **Entomological Pests and Problems of Southern Nigeria.**—*Bull. Entom. Research, London*, iv, pt. 3, Nov. 1913, pp. 191-220, 2 figs., 6 pl.

This report deals with the investigations made by the author in Southern Nigeria in 1911-1912. Insects attacking cotton are the cotton stainers (*Dysdercus superstitiosus*, F., and *Oxycarenus dudgeoni*, Dist.); boll-worms (*Diparopsis castanea*, Hmp., *Earias biplaga*, Wlk. and *Chloridea obsoleta*, F.); leaf-rolling caterpillars (*Sylepta derogata*, F., and *Zebronia phenice*, Cram.); cotton aphis (*Aphis gossypii*, Glov.), leaf-eating beetles (COCCINELLIDAE: *Epilachna chrysomelina*, F., *E. similis*, Muls.; LAGRIIDAE: *Lagria villosa*, F., and *L. viridipennis*, F.; CURCULIONIDAE: *Siderodactylus* sp.; CHRYSOMELIDAE: *Syagrus calcaratus*, F., *Plagiodera circumcincta*, Sahlb., *Ootheca mutabilis*, Sahlb., and *Nisotra uniforma*, Jac.); leaf-eating caterpillars (*Euproctis* sp., *E. lyonia*, Swinh.); scale-insects (*Pulvinaria jacksoni*, Newst., and *Ripersia* sp.).

The study of the Red Cotton Stainer (*Dysdercus superstitiosus*) occupied considerable attention; it is the worst pest of Southern Nigerian cotton, and does an immense amount of harm both to the seed and to the lint. It is widely distributed in the Colony, being mostly in evidence during March, the time of the ripening and shedding of the seed of the silk-cotton tree, and from September to the end of November, during the ripening of the cotton bolls. The bugs suck the juices of the rich oily seeds of the cotton, Hibiscus and silk-cotton tree, and stain the white lint of their food-plants with yellow excretory juices. The eggs are laid in clusters, the average number in each being about 63. The breeding period lasts for about 9 to 10 weeks; the newly hatched young soon become active, and crawling up the cotton stalk, swarm upon the opened bolls and suck the cotton seed; there are five moults. Natural enemies have not been discovered. It is of great importance to keep the plantations free from all weeds, etc.; the presence of the silk-cotton tree has also been shown to be prejudicial. Collecting the stainers is best undertaken early in the cotton season. A collecting net suitable for the purpose is described and figured. The planting of trap-crops to entice the stainers away from the cotton plants is suggested, but was not tried. General measures are recommended, such as gathering the cotton as soon as it is ripe, sunning it well, and constantly turning it over, which causes the stainers to crawl away, and the burning of old cotton-stalks, which harbour the pest. Some foreign cottons are not so liable to attack as the native varieties, but their lint-bearing qualities are not so good.

The Black Cotton Stainer (*Oxycarenus dudgeoni*) is also widely distributed; it appears in November. The insect feeds and breeds

in the opened cotton bolls, sucking the juices from the seeds. The eggs are laid in clusters of apparently about 20; the wingless young swarm in December. Their favourite food-plants are species of Hibiscus. The extent of the damage they do has not been estimated exactly, but their abundance suggests that it is considerable. The remedies advocated for the Red Cotton Stainer apply equally to this species.

The boll-worms mentioned above are widely distributed; the caterpillars bore into the unopened ripening cotton bolls and devour the seeds inside, while *Diparopsis castanea* and *Chloridea obsoleta* eat the flower-buds also. The damage is serious, and so far no natural enemies have been discovered. Spraying with lead chromate is the most effective remedy. A careful look-out should be kept for leaf-rollers and boll-worms during August and September, and immediately their presence is detected the leaves, bracts, bolls, and buds should be thoroughly sprayed; the number of sprayings must depend upon the condition of the crop as the season advances; at the end of the season all the old stalks with diseased bolls should be burnt. The same spray will effectively control the various leaf-eating caterpillars.

The cotton aphis (*Aphis gossypii*) is kept well in check by natural enemies, including lady-bird beetles (*Chilomenes lunata*, F., and *C. vicina*, Muls.), hover flies (*Paragus borbonicus*, Mcq., *Syrphus aegyptius*, Wied., and *S. nasutus*, Mcq.), and lacewing flies (*Hemerobius* sp. and *Chrysopa* sp.).

The insects affecting cacao are leaf-eating caterpillars (*Diacrisia maculosa*, Stoll, *Diacrisia* sp., *Prodenia litura*, F., and *Rhopalocampta forestan*, Cram.); leaf-eating beetles (*Adoretus hirtellus*, Castn.); a pod borer (? *Myelois*)*; scale-insects (*Pseudococcus virgatus* var. *madagascariensis*, Newst. and *P. citri*, Risso).

The measures for combating leaf-eating caterpillars and beetles resolve themselves into:—(1) clean farming; (2) the segregation of cacao-beds from maize, since many pests of the latter migrate to the cacao; (3) a combination of hand-collecting and spraying with Paris green or lead arsenate.

Red tree ants (*Oecophylla*) are not harmful to cacao trees, but their presence adds a difficulty to the collecting of the ripe pods, owing to their vicious bites. The best method of combating them is to cut down their leaf-nests and destroy them. An Ichneumonid, *Metopius discolor*, Tosq., was bred from *Prodenia litura*, and a Tachinid fly of the genus *Sturmia* from *Diacrisia maculosa*.

The author says that the general condition of the native cacoa farms is at present bad, the chief defects being that the land is not thoroughly cleared and stumped; that the trees are not planted so that they may be readily worked; and that decaying branches and pods are left on the trees and on the ground.

The insects recorded as affecting maize are *Cirphis ? phaea*, Hmp., *Calamistes praepallens*, Hmp., *C. fusca*, Hmp.; leaf-eating beetles (*Lagria villosa*, F., and *L. viridipennis*, F.), and the locust, *Zonocerus variegatus*, L. *C. phaea* should be combated by burning the grass or

* [From specimens received from Mr. W. H. Patterson, Government Entomologist in the Gold Coast, this insect proves to be *Characoma stictigrapta*, *Hmp.*, a Noctuid moth of the sub-family SARROTHRIPINAE. The species was also bred from the fruit of kola by the late Mr. L. Armstrong in the Gold Coast.—ED.]

bush round the fields; when once the caterpillars have gained the maize plants damage can only be prevented by spraying. Not enough work has been done upon the other pests of maize to warrant giving specific remedies.

The insects recorded as damaging yams are the beetles, *Prionoryctes caniculus*, Arrow, *Crioceris livida*, Dalm., *Apomecyna parumpunctata*, Chev., *Lagria villosa*, F., and *L. viridipennis*, F., and *Zonocerus variegatus*. To combat *P. caniculus* spraying with a stomach poison is suggested, a method which applies also to *C. livida*.

The larvae of the following moths are recorded as affecting Funtumia rubber:—*Glyphodes ocellata*, Hmp., *Nephele aequivalens*, Walk., which is of rare occurrence, and *Thermopteryx elasticella*, Hmp.; also a Thrips, *Physothrips funtumiae*, Bagn.

Mahogany trees (*Khaya senegalensis*) suffered from the attacks of lepidopterous larvae, which bore into the stem. Arabian coffee is affected by a beetle, *Ootheca mutabilis*, Sahlb., and the bugs, *Antestia variegata*, Thunb., *Riptortus tenuicornis*, Dall., and *Dictyopharina serene*, Stål. Other plants attacked by insects are recorded, namely, the oil palm, attacked by a weevil, *Rhynchophorus phoenicis*, F.; the coconut palm, by another weevil, *Temnoschoita quadrimaculata*, Gyl.; kola, by a Rutelid beetle, *Adoretus hirtellus*, Castn.; and okra by various cotton pests.

The author concludes by pointing out the need of pioneer entomological research, which is essential before the necessary instruction with regard to insect pests can be given to the native farmers.

GROSSHEIM (N. A.). **Къ біологіи люцерноваго долгоносика и его паразитовъ.** [On the biology of *Phytonomus murinus F.* and its parasites.]—**«Энтомологическій Вѣстникъ»** [*Messenger of Entomology.*] *Kiev*, ii, no. 1, 1913, 21 pp.

This investigation was undertaken upon a request from the Department of Agriculture of the United States, transmitted through N. V. Kurdjumov, for information concerning the parasites of *Phytonomus murinus*, the lucerne weevil. The author conducted his enquiry in the province of Kuban, where, according to him, these insects threaten to develop in the near future to a dangerous degree.

The hibernating beetles emerged during April, but disappeared again under the earth or inside the plants on cold days. Just after emergence the insect does not touch the leaves, but feeds on the summit of the stem, in which it gnaws holes. The eggs are usually deposited in the tender ends of the stem, but also on branches, and frequently near the roots. As a rule, the females prepare a hole in the stem for the reception of the eggs, but occasionally they make use of the stipules, piercing through them and depositing the eggs in the space between them and the stem. The eggs are most frequently arranged in small heaps, which are often roughly conical and sometimes egg-shaped; or more rarely, they are laid in a chain-like row of not more than nine eggs; or again, when deposited on the stipules, they are arranged in a flat-topped pile perpendicular to the stem. The eggs are usually covered by a layer formed of the excrement of the female, but sometimes this is absent, the last egg serving as a cover for the heap. The author figures the various types of egg-heaps, and gives a table

Summarising his observations on the mode of oviposition by one female, which deposited in one and a half months 690 eggs in 47 heaps; in favourable weather there were up to five ovipositions daily, while in bad weather none took place. Oviposition proceeds from the end of March to the end of June, but the number of the beetles decreases noticeably from the middle of June.

The development of the larvae inside the eggs occupies from four to 21 days, depending chiefly on the weather conditions; apparently the larvae which issue first remain inside the egg-cluster till the other larvae appear, as their exit from the heap always takes place at the same time. The author describes and figures the various stages of the larvae, the progressive changes in their habits, and the injuries done to the leaves. The cocoon is constructed among the leaves, three, or sometimes only two, leaves being drawn together into the form of a tube. The pupal stage lasts from six to eleven days.

Parasites were found of all the stages of *Phytonomus murinus*. The eggs are attacked by a small Pteromalid, which has not been identified. This insect proved to be an external parasite, laying only one egg in an egg-heap of the *Phytonomus*; the larva, after feeding on the eggs of the host, pupates without a cocoon inside the heap, the pupal stage lasting 13–15 days. The whole development of the parasite lasts from three to four weeks, so that only two broods of it appear during the summer; in the year of the author's investigations, the percentage of eggs infested by this parasite was 13·33.

Canidiella curculionis, Thoms., infested 3·16 per cent. of the larvae of *P. murinus*. This external parasite attacks the larvae of the host in their latest stages, and the infested larvae prepare a cocoon, but do not pupate. The parasitic larva pupates inside the cocoon of the beetle remaining there during its whole pupal stage, which for the second generation of the parasite lasts through the winter. The cocoon of the parasite possesses a remarkable power of jumping, which the author explains, accompanying his explanations by drawings. He suggests that the purpose of this jumping is either to protect the pupa from hyperparasites, or gradually to destroy the cocoon of the host. Some undetermined PTEROMALIDAE were found to be hyperparasites of *C. curculionis*; cocoons of the parasites so infected lose their jumping power, besides turning transparent and bright yellow.

The larvae of *P. murinus* are also infested by two Chalcids, *Tetrastichus* sp., which is a primary internal parasite, and *Dibrachoides* (*Pteromalus*) *dynaster*, Först., an external parasite; the percentage of infection by these two species is low.

As to the parasites of the pupae of *P. murinus*, there were noticed *Eulophus* sp., an external parasite, and *Pimpla maculator*, F., an internal one; one specimen of the latter was also bred from a larva of the host. This Ichneumonid is much the most important parasite, as 45 per cent. of the pupae were attacked by it. *Catolaccus alter*, Ratzb., was obtained as a hyperparasite of *Pimpla maculator*.

Besides parasites, there were noticed also as enemies of *P. murinus*, the larvae of *Chrysopa* sp., which destroy the cocoon of the weevil and feed on the pupa, and a small red acarid. All these enemies and parasites together destroyed in the season under consideration, 71 per cent. of *P. murinus*.

The author deals further with remedies, which can be best applied against the larvae, as all other stages are more or less effectively protected. He mentions the following measures:—(1) Flooding of the lucerne crops, which remedy cannot however be of importance under the conditions prevailing in the Russian steppes; (2) drawing a wire broom over the field; (3) harrowing with a disc harrow, which is the best remedy; and (4) burning with naphtha.

GOLOVIANKO (Z.). **Таблицы для опредѣленія наиболѣе обыкновенныхъ личинокъ пластинчатоусыхъ жуковъ.** [Identification tables for the more common Lamellicorn larvae.]—Pubd. by A. F. Devrien, St. Petersburg, 1913, 26 pp., 108 figs., 3 tables.

The tables contain descriptions of the larvae of the following beetles, many of which are important pests: MELOLONTHIDAE: *Melolontha melolontha*, L., *M. hippocastani*, F., *Polyphylla fullo*, L., *Anoxia pilosa*, F., *Rhizotrogus solstitialis*, L., *Serica brunnea*, L.; RUTELIDAE: *Phyllopertha horticola*, L., *Anisoplia deserticola*, Fisch., *A. segetum*, Hbst., *Anomala praticola*, F., *A. aenea*, de G.; CETONIIDAE: *Cetonia aurata*, L., *Epicometis hirtella*, L., *Oxythyrea stictica*, L., *Osmoderma eremita*, Laxm., *Gnorimus nobilis*, L., *Trichius orientalis*, Reitt.; DYNASTIDAE: *Pentodon monodon*, F., *Oryctes nasicornis*, L.; GEOTRUPIDAE: *Geotrupes stercorarius*, L., *Lethrus apterus*, Laxm.; APHODIIDAE: *Aphodius subterraneus*, L.; LUCANIDAE: *Lucanus cervus*, L., *Dorcus parallelopipedus*, L.

CARSON (G. M.). **List of insecticides and fungicides.**—*Entom. Notes, Territory of Papua, Dept. Agric., Port Moresby.* Series A, no. 5, 15th Sept. 1913, 3 pp.

The following spray mixtures are tabulated: Lead arsenate: Lead arsenate 1 lb., water 100 gals.; kerosene emulsion (*a*): soft soap 1 quart, hot water 2 quarts, kerosene 1 pint; kerosene emulsion (*b*): hard soap 1 lb., boiling water 1 gal., kerosene 2 gals.; red oil mixture: red oil 1 gal., soft soap 1 lb., water 14 gals.; resin wash: resin 20 lb., caustic soda 3½ lb., fish oil 3 pints; resin compound: powdered resin 3 lb., washing soda 3 lb., water 1 gal.; Bordeaux mixture: bluestone 6 lb., lime (unslaked) 4 lb., water 40 gals. Concise instructions for preparing these and remarks as to their use are given. The list of chemicals, sprayers, etc., and the section headed "General Notes," are of practical value.

PRATT (H. C.) and SOUTH (F. W.). **Progress Report on Locust Work since June 1913.**—*Agric. Bull. F.M.S. Kuala Lumpur*, ii, no. 3, Oct. 1913, pp. 53-59.

The authors report that in Negri Sembilan and Selangor there was a marked increase of locusts during the first part of the year 1913. Destruction of large numbers of hoppers has been carried out, though the work was only in the experimental stage. By far the most important of the food-plants of these insects are grasses, especially "lalang" and "love-grass," commonly found along the roads in these districts. These form their staple food supply, but should the insects

continue to increase as they are doing, other food will be required. It has been reported that young coconuts have been destroyed by continued attacks of flying locusts and hoppers have eaten down the paddy to below water-line. Of the garden plants, the bamboo is very liable to attack. Tennis-lawns, golf-greens, padangs and race-courses have been rendered brown and unsightly by these insects in a few hours. In the Malay kampongs, sugar-canes, bananas, pine-apples, paddy and coconuts have been eaten. Slight damage has also been done to rubber trees by the weight of the insects settling on the branches or main stems of young plants causing them to snap. The rubber leaves are only occasionally nibbled.

The driving and pit system of dealing with these insects used in other parts of the world entails an immense labour force, and much expense in digging ditches, and on this account can only be used for small swarms in the Malay States, where a large amount of labour is not generally available. Moreover, the hoppers are able to get out of the pits of almost any depth, unless killed upon entering them or prevented from escaping by a gang of coolies or other means. Another method, not used in Malaya, is that of driving the hoppers into drainage ditches, where kerosene has been added to the water. This surface film of kerosene on the water soon causes their death. Arsenical poisons are probably effective, but considered too dangerous for use, since the poisoned grass is liable to be eaten by animals. Spraying with kerosene, where used in strong emulsion, has deadly effects, but the damage it causes to the rubber fittings of the sprayers has prevented its use on a large scale. The only practical method in such a country consists in driving the young hoppers into V or W-shaped enclosures, which end in special traps constructed for the purpose, and which can be erected in three minutes by three coolies. The traps consist of strong canvas bags, the entrance to which is two feet high, and is approached by an inclined plane 4 feet each way, which is also the width of the bag. The remaining two sides and back of the bag are 4 ft. 6 in. high, and the two sides are prolonged into two wings 4 ft. in length, and attached at the bottom to the sides of the inclined plane. The whole is supported by iron stakes, furnished at the top with hooks from which the bag is suspended by steel rings, sewn on to the material at the corners. The same means is also used to support and stretch the wings. The shape of the bag is preserved by four bamboo poles run through folds two feet from the ground. These bamboos are held in place by iron stakes with rings at the top. Against the front bamboo the inclined plane is stretched, being held in position by a bamboo, run through a fold at the bottom and fixed to the ground by short iron or other stakes. To prevent the escape of hoppers below the wings and inclined plane, a little earth is thrown on the wings and in front of the inclined plane.

The escape of the hoppers from the bag is prevented by strips of American cloth from 6 ins. to 12 ins. wide, which are sewn on the inside from the height of the opening downwards. The sides of the enclosure consist of strips of strong calico 4 feet 6 inches wide and 15 yards in length. This material is very portable. On the inside two parallel strips of American cloth 6 inches wide are sewn at the height of 3 feet and 4 feet from the bottom. At the top is attached a rope strongly sewn on with twine, leaving apertures every inch. The sheeting is

suspended from iron stakes 4 feet 6 inches in length, furnished with a hook and over which the rope is hung. The sheeting is held down by a continuous line of soil heaped on its free edge.

A quarter of a mile of this apparatus can be placed in position before an advancing swarm by ten proficient coolies in half an hour. Moreover, it is easy when the swarm is inside the enclosure to cut off their retreat by closing the open end of the V or W. It has been found that when a large swarm of hoppers has eaten out the available food supply behind it that they will pour into trap bags for eleven hours without stopping, necessitating the erection of further traps, or changing those that are full, and this with practically no driving. It is a remarkable sight to see these insects hopping towards the trap, pouring up the inclined plane and dropping into the trap in a stream that is almost as regular as a stream of water, killing each other by their weight and struggling inside the trap. Circling out of the V may occur, but can be stopped either by placing subsidiary traps on the arms of the wings and facing the original trap, or, which is easier, by modifications in the erection of the sheeting. In most cases it is desirable to drive the swarms by means of coolies placed behind them. In one instance, near Setapak village, with three traps, 300 yards of sheeting and 15 coolies, about two million insects, a portion of a swarm, were destroyed during the day. Rewards offered to natives for information as to the locality of breeding grounds or hoppers have been the means of locating hundreds of swarms.

PRATT (H. C.). **The Locust Pest in Malaya; a Short Survey and a Brief Description of its Life-History.**—*Agric. Bull. F.M.S., Kuala Lumpur*, ii, no. 4, Nov. 1913, pp. 76-80.

Before organising the campaign against the locust pest several methods of control were tried, and the most successful was found to be the driving and trap system. No reliable information as to the origin of these insects is available. They first appeared in the Malay States about 20 months ago in the neighbourhood of Port Dickson, and since then have spread, mostly in a northerly direction, over 100 miles of country. The life-history of the locust has now been completely worked out, and the details are given. The species does not appear to have been identified.

SOUTH (F. W.). **Work on Locust Destruction in September.** *Agric. Bull. F.M.S., Kuala Lumpur*, ii, no. 4, Nov. 1913, pp. 85-88.

In Selangor there were three main centres of distribution of hopping locusts, the district of Ulu Selangor, the neighbourhood of Kuala Lumpur and the district between Kuala Lumpur and Kajang. In each district was a Special Assistant who employed at first only one or two gangs, though these were increased later as fresh supplies of apparatus were obtained. The results of the month's work were 5,322 kerosene tins full of hoppers in all stages, representing 104 swarms. In addition, 2,083 kerosene tins of hoppers were reported to have been captured by the Malays in Kuala Kubu districts, working independently with their own apparatus, copied from that used by the Department. In Negri Sembilan, at the end of the month, two breeding grounds and one

swarm of hoppers had been reported in the Tampin districts. In the Coast district numerous small swarms occurred, and the Special Assistant with one gang destroyed 42 swarms. The deficiency in the amount of apparatus has constituted a severe handicap on the work. The damage caused by the locusts has not been very serious.

MASKEW (F.). **The Gunworm of the Grape.**—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, pp. 677-679, 2 figs.

The material used for this description of the gunworm (*Sciapteron regale*, Butl.), a Sesiid moth, was taken from some confiscated vine-cuttings brought from Yokahama to San Francisco by a passenger. Swellings on the twigs indicated some abnormality, and were found to contain the larvae of a Sesiid borer. These larvae bore into the canes of the grape-vines and are very destructive in Japan. The paper concludes with a description of the life-history of the insects by E. O. Essig.

ESSIG (E. O.). **The Western Twig Borer.** *Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, pp. 681-684, 3 figs.

The author received twigs of apricot trees severely injured by a Bostrychid beetle, *Amphicerus punctipennis*, Lec. The burrows, which may occur anywhere on the twigs, vary from one to three inches in length and are about one-eighth of an inch in diameter. The beetles bore into the twigs for food and protection, not to deposit eggs, and the burrows cause the smaller twigs to break. This species seems to prefer dead or dying wood. A desert plant (*Prosopis juliflora*, D. C.), is reported by Dr. Van Dyke as the normal food-plant, and other known hosts are pear, dead fig-tree branches, dry canes of the grape-vine, apricot and dry orange wood. It has a wide distribution in South West California, Dr. Van Dyke specially mentioning Los Angeles and Imperial Counties. Control measures suggested are, the destruction of breeding places if possible, the elimination of unhealthy trees and all dead wood, and the maintenance of trees in good growing vigour.

VAILE (R. S.). **Effects of Hot Weather on Lemon Trees Sprayed with Lime-Sulphur.** *Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, p. 692.

Lemon trees sprayed with both Rex and Ortho lime-sulphur solutions ten days before the excessive heat were found to be very seriously burned, and a large proportion of the fruit was completely ruined. The author states that he has never seen spray injury due to heat arise after so long an interval.

VOSLER (E. J.). **Calendar of Insects Pests and Plant Diseases.** *Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, pp. 695-699, 1 fig.

Among the deciduous and citrus fruit insects the fall cankerworm (*Alsophila pometaria*, Harr.) is known as a pest of apple, prune, cherry, and apricot. The eggs are attached to the bark in masses of from

60 to 200, placed in exposed situations by the wingless females which emerge from the middle of October to the middle of December. The use of bands around the tree trunk, placed in September and October, has been recommended to trap the females as they ascend the trunks to deposit their eggs.

The use of distillate emulsion for spraying for the black scale on olive is recommended by E. O. Essig, his formula being 20 gals. of distillate (28 degrees Baumé), 30 pounds of whale-oil soap and 12 gallons of water; dissolve the whale-oil soap in the water, heating it to the boiling point, add the distillate and agitate thoroughly while the solution is hot; for use, add 20 gals. of water to each gallon of the above mixture. The crude oil emulsion (formula given below) is also recommended. For the brown apricot scale, Essig recommends spraying with caustic soda and distillate, or distillate emulsion and crude oil emulsion, when the trees are dormant. The formula for the distillate emulsion is the same as that for the black scale. The formula for the caustic soda mixture is: Water, 200 gals.; caustic soda (95 per cent.), 7 lb.; and 10 gals. of distillate (28 degrees Baumé). Fill the spray tank with the required amount of water, add the caustic soda which has been dissolved in a small amount of water, and then add the distillate; keep the agitator going rapidly while applying the spray. For the crude oil emulsion the formula is: Water, 175 gals.; liquid soap, 3 gals.; and crude oil (direct from wells) 25 gals. Fill the spray tank with water, add the liquid soap, agitate for one minute, then add the crude oil, continuing the agitation while the spray is being applied. Fumigation is also recommended as soon as possible after the young scales are hatched. Three-fourths or even half of the regular schedule No. 1 may be used, a two-thirds dosage appearing to do as well as a full dosage.

Among the cereal and forage crop insects, the clover seed Chalcid (*Bruchophagus funebris*, How.) is reported as a serious pest. This Chalcid will infest the seed of red and crimson clover, besides alfalfa, a favourite host; they feed on the substance of the seed and often totally destroy the contents. The eggs are deposited in the seeds. The adults do not emerge from the seeds till the following spring or early summer. Remedies for this pest are in an experimental stage. Professor F. M. Webster suggests as a preventive measure the destruction of all outstanding alfalfa plants in the autumn, the chaff and stems to be burned. Delaying the seed crop by early pasturing or clipping of the first growth in the spring until the seed Chalcid has done most of its destructive work, promises to be useful as a control measure.

For the destruction of locusts or grasshoppers a mixture used by the Government of South Africa is recommended. This consists of one gallon of treacle mixed with one half gallon watery solution of arsenite of soda (69 per cent. white arsenic). This mixture is diluted for newly-hatched locusts to one part to 66 of water; when used against locusts two weeks old, it is diluted one part to 50 of water. Where the application is made in fields not accessible to domestic animals, farmers have used it as strong as one to 30 or 40. Since the egg-masses of grasshoppers are deposited in the hard, uncultivated lands during the late summer and early autumn, ploughing, harrowing, and disking such waste lands to a depth of several inches in the late autumn will lessen future attacks.

For the destruction of the alfalfa caterpillar (*Autographa gamma californica*, Speyer), renovation of alfalfa fields during the winter months is recommended. This will destroy large numbers of the hibernating pupae. Pasturing the fields will also aid in the destruction of the resting stage of this insect. Among the truck crop insects the corn ear worm (*Chloridea obsoleta*) has been reported as causing much damage to tomatoes. The use of an early trap crop, as well as early maturing varieties, the hand-picking of infested tomatoes to prevent the larvae spreading, autumn ploughing of infested ground, and the proper disposal of unsaleable infected tomatoes, will help in the protection of the next year's crop.

ESSIG (E. O.). **Insect Notes.** *Mthly Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, p. 705.

Asterolecanium variolosum has been reported as working on oak trees at Stackton by F. Maskew. Young pine trees (*Pinus radiata*, Don.) have been seriously damaged by *Ips* (*Tomicus*) *confusus*. A new *Kermes* has been found working on *Quercus agrifolia*, Neé.

STRONG (L. A.). **A Fortunate Find.**—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 10, Oct. 1913, pp. 709-711, 1 fig.

Examination of "Kamani nuts" (*Terminalia catappa*) brought from Honolulu and destined for planting in Southern California, showed them to be badly infested with living larvae of the Mediterranean fruit fly (*Ceratitis capitata*, Wied.), and they were consequently confiscated. Had this been overlooked the worst known insect pest of fruit and vegetables would probably have been established in California.

VOSLER (E. J.). **Zebra Caterpillar** (*Mamestra picta*, **Harris**).—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 11, Nov. 1913, pp. 713-715.

The eggs of this caterpillar are deposited on the alfalfa leaves, and hatch in a few days. The young larvae eat the epidermis of the leaves, which soon appear whitish from their attacks, and they web the tops of the alfalfa stalks together. In the young stages the larvae work in colonies and only on the upper more tender portions of the plant. In an alfalfa field at Salt Lake, Utah, it was noted that in the latter part of September and in the early days of October when the leaves of alfalfa were becoming too tough, the larvae migrated to the edges of the field to feed on the tender growth of dock. From September to October the caterpillars enter the soil to pupate. At present the best method of control for this pest is picking and destroying infested tops. If the fields are pastured at this time of the year little damage will result from this insect's attack. This moth occurs in the Atlantic States, Colorado, Utah, and California. It also attacks cabbage, celery, beets, and other garden vegetables. A species of Tachinid fly and an Ichneumonid (*Campoplex*) have been reared from *M. picta*. The *Campoplex* emerges from the larva at about the third stage.

Essig (E. O.). **A Serious Philippine Orange Moth.**—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 11, Nov. 1913, pp. 722-723, 1 fig.

The author states that Professor C. F. Baker has called particular attention to a small moth which works in a variety of native orange in the Philippines, called the "cajel." It has been determined as *Prays citri*, Mill., of which *Prays nephelomima*, Meyrick, is a synonym. The larvae of this moth live just beneath the rind next to, but not in, the pulp. They produce gall-like tumours, which are often exceedingly numerous, and which remain open at the tips, affording excellent germinating places for destructive fungi. The opening is usually about one-eighth of an inch in diameter. The danger of the introduction of this moth into California is greatly reduced by the quarantine laws, which are being maintained against all countries where the fruit flies (Trypetidae) are known to exist. The recognition of the pest by quarantine offices may prevent its introduction from some other section of the world where these laws do not apply.

General Notes.—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 11, Nov. 1913, pp. 721-728, 731.

E. O. Essig notes some of the discoveries of Professor C. F. Baker in the Philippine Islands with regard to fruit flies. The melon maggot, *Dacus cucurbitae*, Coq., is abundant there; and another fly, the maggots of which he found swarming in wild oranges, proved to be a new genus and a new species named by Bezzi, *Monacrostichus citricola*. Professor R. W. Doane has recently collected the Queensland fruit fly, *D. zonatus*, Coq., on the Island of Tahiti. All these fruit flies are serious pests, so these records are of value to the horticultural quarantine departments. E. O. Essig also quotes the formula of a spray for the control of tomato Thrips, devised by R. T. Watson, of the Florida Agricultural Experiment Station, which, on a trial piece, killed 78 per cent. of the Thrips. The mixture consists of commercial lime-sulphur (33° Baumé), 5½ gals.; "Black-leaf 40," 14 fluid ounces; water, 200 gals.

A. J. Cook records the occurrence in California of an as yet undescribed weevil, which was found in large numbers doing no little damage to the tender foliage of apricot trees. The occurrence of a new species in large numbers all at once is difficult to explain. Possibly it is an importation or it may have come from some indigenous wild plant. This new beetle is an Otiorrhynchid allied to Fuller's rose beetle, *Aramigus fulleri*, the larvae of which feed upon the roots of roses, raspberries, blackberries, and other rosaceous plants. It is not known upon what this new pest feeds in the larval stage; the beetle does not appear till midsummer.

C. W. Beers reports a millipede doing considerable damage to the tender roots of vines in Santa Barbara county. B. R. Jones also reports it as doing serious harm to lettuces: it feeds largely on decaying vegetable matter. The dark blue blister beetle, *Cantharis stygica*, Lec., is reported to have done considerable damage to buds and blossoms of asters in Philo, Mendocino County, Cal. The red-humped caterpillar, *Schizura concinna*, S. and A., has been attacking the foliage

of apples, prunes, cherries, pears, and walnuts at Modesto. R. S. Vaile has reared from *Aspidiotus hederae*, Vall., *Aspidiotiphagus citrinus*, Crwf., and *Aphelinus fuscipennis*, Howard. *Chelonus shoshoneanorum*, Vier., has been reared from the potato tuber moth, *Phthorimaea operculella* by H. A. Weinland of San Diego County.

VOSLER (E. J.). **Calendar of Insect Pests and Plant Diseases.**—*Mthly. Bull. State Commiss. Hortic., Sacramento*, ii, no. 11, Nov. 1913, pp. 729-730.

The squash bug winters in the adult stage under rubbish and among old vines. Clean culture is therefore an important remedial measure. Insects in stored products, such as the grain weevil, pea weevils, flour moths, etc., are best checked by fumigation with carbon bisulphide. An air-tight fumigating room is an essential. Pour the carbon bisulphide into shallow dishes and place in the bins, using 5 lb. to 1,000 cubic feet of space. The temperature should be 70° Fahr. or above for the best results. Insects in greenhouses, such as red spiders and mealy bugs, are best checked by syringing the plants forcibly with water two or three times a day. The caterpillars of the California tussock moth feed upon young fruit and foliage. This pest spends the winter in the egg stage, the eggs being in masses attached to the trunks of trees and adjacent objects; the hand-picking of egg-masses will greatly reduce their numbers.

BALLARD (E.). **Pests of Stored Grain.**—*Supplement No. 4 to the Nyasaland Government Gazette, Zomba*, xx, no. 12, 29th Nov. 1913, p. 298.

A short account is given of pests of stored grain in Nyasaland, the two chief of which are the Grain Moth (*Sitotroga cerealella*, Ol.), and the Rice Weevil (*Calandra oryzae*, L.). With these is often found another beetle, *Tribolium confusum*, Duv., which, however, does no serious damage. Fumigating with carbon bisulphide is recommended.

FRENCH (C. Jr.). **Insect Pests of the Potato.**—*Jl. Dept. Agric. of Victoria, Melbourne*, xi, pt. 12, Dec. 1913, pp. 729-748, 13 pl.

The dreaded Colorado beetle and a few other pests prevalent in America and elsewhere are absent from Australia, and with the careful inspection and quarantine in Melbourne of all potatoes arriving from abroad, growers have little fear of new pests being introduced. The Potato Thrips, *Thrips tabaci*, Lind., has caused considerable losses, and appears to be on the increase. They attack plants of all kinds. If débris is examined during the winter, they are found in great numbers; the first warm days of October brings them out in thousands, and on the underside of the potato leaves they will be found in varying stages of development. Total development occupies 10–15 days in Victoria. The thrips pest is a serious one, and unless definite measures are taken against it, it will be impossible to grow good crops; the lower leaves of the plant are attacked first and as these are destroyed the top ones are affected in turn. All débris on potato fields should be destroyed; by this means hibernating insects and their eggs will be

eradicated. Various spraying methods have given good results. Mr. G. Seymour and the author used tobacco wash with a Strawsonizer spraying outfit; the formula for the tobacco wash is as follows: Steep 1 lb. of tobacco in 1 gal. hot water, and soak for 24 hours; boil 1 lb. soap in 1 gal. water; strain the tobacco water into the soap water; stir, and make up to 5 or 6 gals. Benzol emulsion, costing about 4d. per lb., has proved effective; 1 lb. makes 5 or 6 gals. of spray. Hellebore or a weak kerosene emulsion has also given good results. In America the use of lime in the following proportions has been recommended: 35 lb. lime to 100 gals. water. Mr. Moulton, who has experimented with thrips in America, advocates the use of oil and water in making up the tobacco spraying fluid, and gives the following formula: Distillate oil emulsion, $1\frac{1}{2}$ to 2 per cent. solution; black leaf tobacco extract, 1 part to 60 parts of water. The distillate oil emulsion is prepared as follows:—Hot water, 12 gals.; white oil or fish oil soap, 30 lb.; distillate oil (23 degrees, Baumé), 20 gals. The soap is dissolved in a kettleful of boiling water and poured into the spray tank; the oil is added and the mixture agitated violently, and sprayed under a pressure of 125–150 lb. into other barrels. This stock solution is diluted before use with 24 gals. of water to each gallon of solution. As a deterrent against thrips coal-tar water has been recommended. Boil 1 lb. coal-tar in 2 gals. water, and while hot, add from 50 to 100 gals. more water.

Cutworms and looper caterpillars, army worms, etc., have been destructive to potato crops. Especially mentioned are the Silvery Moth (*Plusia argentifera*), the Potato Looper Moth (*P. verticillata*), *Chloridea obsoleta* and *Leucania* sp. By the eradication of weeds and the burning of haulms and stems of harvested crops, many eggs are destroyed. Placing bundles of succulent plants, which have previously been dipped into a mixture of Paris green (1 oz. to 39 gals. of water) between the rows of potato plants will kill a large number of the caterpillars, and is harmless to the potatoes. Poisoned bran has been successfully tried, especially against the Silvery Moth. The author recommends the poisoning of lucerne or other green stuff, to be distributed as a bait. One lb. of arsenate of soda is dissolved in 10 gals. of water, to which 8 lb. of treacle or brown sugar is added; the green stuff is moistened with the liquid and scattered broadcast, preferably a few days after the ground has been ploughed. Where a spray is used instead of bait, arsenate of lead has proved one of the best. The trench system is a simple and effective method of eradication; a trench is dug around the crop, it must have clean cut sides, and the sides nearest the crop should be undercut to prevent the worms from crawling out of the trench. Deep holes should be made in the trench at intervals of about five yards. When travelling towards the crop the cutworms fall into the trench, and crawling along it fall into the holes, where earth should be thrown over them and pressed down.

The Potato Moth (*Phthorimaea solanella*, Boisd.) is the worst potato pest in Australia. The young larvae usually feed upon the eyes of the potato; they then tunnel towards the centre of the tubers, causing them to turn brownish-black, and inducing decay. The pupae are attacked by various parasites and bacterial diseases, which destroy great numbers. All débris in the fields should be burnt. Seed infected with the grubs should never be planted, nor should ground where

affected potatoes have been grown be used again for the same crop. Potatoes should never be left exposed in the field or store-room, but placed at once in bins, pits or any other receptacle where the moths cannot reach them. Trapping by means of lamps is of use in destroying the moths, which fly at night. Spraying the crops, when the moths begin to appear is advisable, as this will destroy the young grubs as soon as they begin to feed. A good arsenical spray is prepared as follows:—Boil 1 lb. white arsenic and 2 lb. carbonate of soda (crystals) in $\frac{1}{2}$ gal. of water for 20 minutes; separately dissolve 7 lb. arsenate of lead in 1 gal. warm water; when both mixtures are cold, mix them together. Bottle into twelve 1-pint bottles, and use one bottle to 20 gals. of water. Mix the chemicals in wooden buckets.

The Potato and Tomato Weevil (*Desiantha nociva*, Lea) is a comparatively new pest of the potato. It does considerable damage, and both larvae and adults are equally destructive; it is a prolific breeder, and every possible means should be taken to prevent its spread. All weeds, especially marshmallows, on land adjoining potato crops should be destroyed. Arsenate of lead spray has been experimentally proved to keep the pest in check.

Jassids, Leafhoppers or Froghoppers are found in large numbers, occasionally doing damage to young leaves and shoots. If the damage bids fair to be serious it would be necessary to spray the crop with benzol emulsion, 1 lb. to 5 gals. of water.

The Rutherglen Bug (*Nysius vinitor*) is one of the most destructive of plant bugs in Victoria. The prevention and remedies are those which are recommended for thrips.

A large number of species of wire worms (ELATERIDAE) are found in Victoria, where however, they do not make much headway, owing no doubt to natural enemies. One of the best methods of keeping wire worms under control is to turn the ground over frequently, exposing the insects to birds. Poisoned baits, made by cutting up a few turnips, carrots, etc., and soaking them in arsenate of lead, have given good results. Manurial insecticides worked into the soil have also been tried with success.

The Victorian White Ant (*Termes lactis*, Froggatt) is a destroyer of timber and furniture, as well as apricot, plum and other fruit trees, vines, potatoes, etc. Although it has so far caused no serious damage to potatoes, it should be watched, and, if the circumstances warrant, all old stumps, etc., which harbour the insect should be removed. Another plan is to dig Vaporite into the soil, which is then pressed firmly down; the quantity of Vaporite used is generally at the rate of 225 lb. per acre for light soils, and about 350 lb. for heavy soils. Manurial insecticide worked into the soil has given good results.

SYMONS (T. B.) and CORY (E. N.). **Miscellaneous Insect Pests.**—*Maryland Agric. Exper. Sta., College Park, Bull.* 175, March 1913, pp. 171-179. [Received 31st Jan. 1914.]

A formula is given for a lime-sulphur spray against San José scale (*Aspidiotus perniciosus*), and for terrapin scale, (*Lecanium nigrofasciatum*), a standard miscible oil at a strength of 1:15, applied to the tree as late in the spring as possible, is recommended. The woolly apple aphis (*Eriosoma lanigerum*) is stated to be very common in apple

orchards, and of numerous remedies tried, 10 per cent. kerosene emulsion seems to be the most effective against this and other aphids. The loss caused by Hessian Fly (*Mayetiola destructor*) is periodic, but has increased during the last two years in Maryland. When wheat is infested in winter or early spring it is best to pasture sheep in the field, that they may eat the wheat down to the roots. As the insect passes the summer in the wheat stubble, this should be burned over or ploughed under as soon as possible after harvest. Rotation of crops is very beneficial. A list of cities and towns is given and dates *before* which wheat should not be sown in these places. In 1912, alfalfa, corn, millet, lawns and other crops or plants in their vicinity were seriously damaged by the fall army worm (*Laphygma frugiperda*). The larvae can be controlled by the use of poisoned bait spread over the infested area. The pickle worm (*Diaphania nitidalis*) also caused considerable damage to cucumbers, melons, and early and late squashes and pumpkins in 1912. The moth deposits her eggs in the blossoms and the larvae enter the young fruits, where they live until mature. A trap crop, coming into blossom before the main crop, is a valuable method of collecting the eggs and larvae. All rubbish after the crop is taken should be burned. Widespread injury has been done to black locust trees, especially along the Potomac River, by the locust Hispid (*Chalepus dorsalis*). The larvae of this insect feed between the two surfaces of the leaf, where they also pupate. A poison spray of 4 lb. arsenate of lead to 50 gals. water was very effective, and the use of soap in the spray was found to make the solution adhere to the foliage better. Burning over the wood lots in late autumn may prove beneficial. The orange-striped oak worm (*Anisota senatoria*) has caused considerable defoliation of the pin-oaks, and severe injury in some nurseries. Two pounds of arsenate of lead to fifty gallons of water used as a spray will control the pest.

CORY (E. N.). **The Peach-Tree Borer.**—*Maryland Agric. Expt. Sta., College Park, Bull.* 176, April 1913, pp. 181-218, 14 figs. [Received 31st Jan. 1914.]

The peach-tree borer (*Sanninoidea exitiosa*, Say) has been known to horticulturists for over 150 years. It has been found breeding in plum, both wild and cultivated, cherry, June berry, flowering almond, nectarine, apricot, azalea, peach trees and shrubs. Wild cherry is probably the native food-plant. The author gives details of several breeding experiments, and notes that the greatest number of eggs deposited by one moth was 161, the greatest number in one place 47 and of all eggs deposited, 390 were on the leaves and 67 on the trunk. The larvae bore into the trunk, feed all the summer, usually in the cambium, and in the autumn work down below ground level. Those entering the trunk higher up rarely reach maturity, possibly owing to extremes of temperature. The pupal stage lasts about 22–23 days. From the eggs the parasite, *Telenomus quaintancei*, Gir., was reared, while a species of *Bracon* and of *Macrodyctium* have been bred from the pupae.

A table and explanatory notes are given showing numerous control measures tried and their results. The author states that, owing to the habits of oviposition of the moths, mechanical barriers cannot be

recommended; repellent washes that depend upon their odour for their effect are useless; coatings intended to present physical difficulties to the entrance of the larvae are ineffective; poison coatings are too readily washed off; and materials used at the base as repellents are ineffective and in some cases dangerous. Banking earth against the trunks to the height of six inches or more has proved the best practice that can be recommended, as the larvae are thus driven to enter at a higher point than normally would be the case. This facilitates the removal of the larva and reduces the cost. Extracting the larvae is certainly effective and when done carefully need not injure the trees. This should be done with a sharp knife and a light wire ending in a small hook; with this the larvae can often be drawn from the burrow. The trees should be "wormed" as late in the autumn as practicable and again in May. To facilitate the work the earth should be drawn away from the trunks to a depth of six inches and the root crowns scraped at least one day before the "worming" is begun. The paper concludes with a lengthy bibliography.

DAVIS (J. J.). **Common white-grubs.**—*U.S. Dept. Agric., Washington, Farmers' Bull.* 543, 18th July 1913, 20 pp. 12 figs. [Received 5th Feb. 1914.]

The most serious outbreak of white grubs (*Lachnosterna*) recorded in the States occurred in 1912, when over 12 million dollars worth of damage was done, mostly in Iowa, Wisconsin, Illinois, Pennsylvania, New York, Connecticut and New Jersey. Available records show that May beetles were unusually abundant in 1908, the grubs causing considerable damage in Wisconsin, Illinois, etc. in 1909, and yet more in 1912. The beetles were very numerous in the spring of 1911, thus giving rather conclusive evidence that the life-cycle of the more abundant and numerous species in those localities is uniformly three years. It is, therefore, reasonably certain that in 1914 the beetles will again be unusually plentiful, and the year following (1915) the grubs will be exceedingly abundant and destructive if uncontrolled, either naturally or artificially. The grubs do the greatest amount of damage in their second year and to the early plantings in their third year. From all observations small grains are less attacked than are corn, timothy, strawberries and potatoes. It is important that the grubs of May beetles should not be confused with similar but non-injurious grubs, or with others which may be injurious but require different methods of control. The grubs of May beetles are not known to breed in manure or refuse of any kind; those generally found in such places being the immature forms of certain brown beetles (*Ligyrus gibbosus*, de G., and *L. relictus*, Say) which frequent light in the same manner as the May beetle. The white grubs and May beetles are preyed upon by numerous enemies, the most important being birds, in the stomachs of 60 species of which the Biological Survey has found these insects. Crows and crow blackbirds are particularly useful, and an instance is given when one of the latter destroyed in all 20 grubs in about one or two minutes. The skunk is probably the most valuable of undomesticated mammals, so that farmers have begun to protect it. Of predaceous and parasitic insects the black digger wasp (*Tiphia inornata*, Say), another wasp (*Elis sexcincta*), and a fly (*Pyrgota undata*)

appear the most beneficial. The knowledge of the several fungous and bacterial diseases reported as attacking the grubs and beetles is as yet superficial and their value for this purpose is still an open question. The author states that all general measures of control recommended are preventive rather than remedial, for once white grubs are present the crop cannot be protected from their ravages. But certain cultural and other practices will greatly minimise the damage in succeeding years. Domestic fowls should be given the run of infested fields, especially when the land is being ploughed. Hogs will thoroughly clear an infested field if pastured on it any time between April and October. They are very fond of grubs and root to a depth of a foot or more in search of them; but in winter the grubs go much deeper and thus escape destruction. It should be noted that the giant thorn-headed worm, *Echinorynchus gigas*, an intestinal worm attacking swine, passes one of the early stages of its life within the white grub, which has been infested through the excrement of infested swine. In this connection Dr. S. A. Forbes says: "Pigs which have never been pastured are certain to be free from these parasites, and grubs growing in fields which have not been pastured by pigs are likewise certain to be free from them. The use of such pigs on such fields would consequently be without danger from this source, and a little attention to these facts will avoid any injurious consequences. That is, if pigs not previously allowed to run out are turned into fields on which pigs have not been pastured within three years, there will be no danger that they will become infested by these thorn-headed worms." During the years of great abundance of the beetles, hogs should be turned into orchards and timber lots during the period of flight and will eagerly seek them out, just beneath the surface of the soil or near trees where they pass the day. Autumn ploughing is very useful. Ordinarily the best time is between 1st and 15th October, as later on the grubs go too far down. The rotation of crops is also very useful, and since the eggs are usually deposited in fields of grass, timothy, and small grains it is evident that such crops as buckwheat, clover, alfalfa, and peas should be planted in the year following a season of beetle abundance. Collection of the beetles is effective where whole communities or neighbourhoods co-operate in the work. It is in the early morning, before 4.30 a.m., that the beetles are most easily shaken off the trees, and each female destroyed early in the season means the destruction of from 50 to 100 potential grubs. Where it is possible to secure cheap labour, collecting the grubs in the wake of the plough is practicable, especially where they are numerous. Light traps are not satisfactory as they attract hardly any female beetles. Spraying with Paris green or lead arsenate is effective, but usually impracticable owing to the large size of the trees upon which the beetles feed. With a more definite knowledge of the food-plants preferred, low-growing trees and shrubs might be planted as traps where the beetles could be sprayed.

No reliable remedy can be offered for the destruction of grubs in lawns; but poultry, especially turkeys, might be allowed to run on them. Hogs would tear up the roots. Perhaps removal of the sods, collection of the grubs, and, later, autumn ploughing, will prove satisfactory. In cases of mild infestation a commercial fertiliser will probably assist the grass in overcoming the grub injury. Dealing

with *Melolontha* in Europe. Decoppet injected carbon bisulphide into the soil at a depth not exceeding six inches, at the rate of 1 to 1½ ounces in 6 or 8 holes per square yard, and this has been found to diminish the number of grubs considerably. Excellent results are obtained by this means against those of the southern green June beetle in the lawns of the Southern States, and it is probable that this method will prove successful with the white grub in lawns. The holes should be plugged with soil or sod to prevent the fumes escaping, and it must be remembered that carbon bisulphide is highly inflammable and forms an explosive compound when mixed with air.

GASTINE (G.). *Diaspis pentagona* (**Cochenille du Murier**). [The mulberry scale.] *Librairie agricole de la Maison Rustique, Paris*, N.D., 45 pp., 9 figs; price 30 centimes.

This is one of a series of popular booklets, each treating of a single subject and written by a specialist. The author points out that the scale-insects and aphids may be considered the most dangerous agricultural pests known, and as through the agency of its agile larvae *Diaspis pentagona* spreads quickly afar, the greatest energy must be employed against it. In its country of origin, the Japanese regard this scale as the worst enemy of the mulberry and other fruit trees, and its rapid dispersal throughout the world is due to shipments of infested plants on which the insect defies the most unfavourable conditions; for it can survive extreme cold and even dessicated fragments of a twig suffice for its subsistence. The author suggests that the destruction by fire of any infested plants imported into a clean country is the only safe measure. Should this be impracticable, scrubbing with wire brushes followed by the burning of all the débris and the thorough application of an insecticide is the best method, the solution being sprayed on the branches and brushed into the bark of the trunk and larger branches. The latest formulae officially advised in Italy are: (1) A. heavy coal-tar oil 22 oz., crude oil of turpentine 2¼ oz., B. common sea-salt 22 oz., wheat flour ¼ oz., water 2 gallons; (2) A. crude petroleum 22 oz., ordinary fish oil 2¼ oz., crude oil of turpentine 1½ oz., B. common salt 22 oz., wheat flour ½ oz., water 2 gallons; (3) A. mixture of mineral oils (density 1·05), called Eusol in Italy, 22 oz., B. common salt 3 oz., wheat flour ¼ oz., water 2 gallons. To prepare any of these the salt is dissolved in the water and the flour mixed in. The oily mixture A, already prepared, is gradually added with very energetic stirring in order to obtain a homogeneous solution. As the component parts tend to separate very readily the author suggests the use of Saponin, which produces permanent emulsions easily. Saponin is not obtainable commercially, but many vegetable products contain this substance, the fruit of *Sapindus utilis* being richest in it. Saponin represents about 50 per cent. of the pericarp, which itself is about 68½ per cent. of the total fruit, and as it dissolves out in water the pericarp may be conveniently employed for the purpose. The author gives four formulae: (1) A., heavy coal-tar oil 2 lb., B. saponin solution obtained by extracting 1 oz. of Sapindus pericarp in 2 gals. of water; (2) petroleum oil or crude petroleum 2 lb., B. saponin solution as above; (3) homogeneous emulsion —A., clear heavy coal-tar oil (density 1045) 20 oz., medium coal-tar oil (density 950) 12¼ oz.,

B. saponin solution as above; (4) homogeneous emulsion A. clear heavy coal-tar oil (density 1045) $28\frac{3}{4}$ oz., petroleum (density 800) $4\frac{1}{4}$ oz; B. saponin solution as above. To prepare solution B., Sapindus pericarp (1 oz.) is boiled for a few minutes in water (1 pint taken from the 2 gallons) and when sufficiently soft it is mashed to facilitate solution of the saponin. This preparation is passed through a No. 65 (French) sieve, as the insoluble particles would clog the sprayer. To extract all the saponin this insoluble residue is placed in the remaining 15 pints of water and again strained out. Into the saponin solution (B) the oily mixture (A) is gradually poured with energetic mixing, when the fine oil globules will remain in suspension. [Cf. this *Review*, A, i, p. 238.] If the oily mixture is heavier than the water it will sink, if lighter, it will float, but the slightest shake will cause uniform admixture; with equal densities the emulsion is permanently homogeneous. The author points out that though his formulae are stronger than the Italian ones, yet owing to the perfect emulsification the shoots are in less danger of being harmed. All the foregoing sprays are for winter use. Should it be desirable to follow up the treatment by spring and summer applications, the percentage of the coal-tar and petroleum oils must be reduced to 1·5 per cent. or 2 per cent. at the most, as otherwise damage will be done. Either the saponin solution may be used, or $1\frac{1}{2}$ oz. of white soap dissolved in the 2 gals. of water when the latter is at boiling point; soft soap contains too many impurities. The insecticide is used as a spray and the first application made when the young larvae appear, is followed by a second at 10 days' interval. The men must be protected by gloves and masks with glazed eye-holes.

The author mentions *Prospaltella berlesei*, a small Chalcid fly now being tested in many parts of Italy and which Berlese hopes will check *D. pentagona*. Other parasites are being studied in Italy, especially by Silvestri. But at the present time direct methods of control are the only ones in real use. The author concludes by giving a list of some 50 different trees and plants affected by the pest and remarks that this list can be added to daily.

HENRICH (C.). **Die Blattläuse Aphiden der Umgebung von Hermannstadt.** [Aphid plant lice in the neighbourhood of Hermannstadt.] *Verh. und Mitt. Siebenbürgischen Ver. Naturwiss. zu Hermannstadt*, lxiii, no. 6, 1913, pp. 195-201.

The present paper forms a supplement to one published by the author on Aphids in 1909. Since then some additional species have been discovered by him in the environs of Hermannstadt, among which are: *Mindarus abietinus*, Koch, on *Abies pectinata*; *Pemphigus piriformis*, Licht., *P. bursarius*, L., *P. borealis*, Tullgren, and *P. lichtensteini*, Tullgren, all on *Populus pyramidalis* and *P. nigra*; and *Phylloxera acanthochermes*, Lichtst., on oak.

SULC (K.). **Zur Kenntnis einiger Psylla Arten aus dem Ungarischen National Museum in Budapest.** [On some species of *Psylla* from the Hungarian National Museum.] *Ann. Mus. Nat. Hungarici, Budapest*, xi, pt. 2, 1913, pp. 409-435.

Seven species of the genus *Psylla* are described from specimens in a

collection from the Hungarian National Museum. Two species are new, namely *P. groenlandica* and *P. horvathi* the former from Greenland and the latter from Hungary; their life-history and habits are as yet unknown. The species *P. heterostigma*, Horvath, is of economic interest, as it attacks the leaves and fruit of the pear; its larva is unknown. It occurs in Eastern Siberia and Japan.

Sur l'emploi des arsenicaux en agriculture. [The use of arsenicals in agriculture]. *Bull. Agric. de l'Algérie et de la Tunisie, Algiers*, xix, no. 19, 1st Oct. 1913, pp. 378-380.

The *Commission des Substances vénéneuses* has handed to the Académie de Médecine, Paris, their new report on a long delayed regulation to modify that of 1846 regarding the use of poisons. Part of the report deals with arsenicals used in agriculture. Subject to safeguards the Académie authorised, in 1910, the use of the potent but dangerous arsenical insecticides, with the exception of lead arsenate, which had just begun to be employed. Its use is now general, as a consequence of its very valuable properties, and it was necessary to decide whether to prohibit it, or to permit it under specified rules. The report recommends the latter course, pointing out that the U.S. Minister of Agriculture specially advises lead arsenate in preference to other insecticides, so that the French markets will be flooded with foreign produce if the French agriculturist is not provided with weapons equal to those of his rivals. Regarding the sale and use of arsenicals, especially lead arsenate, the Report expresses the following desiderata

(1) That the regulations be strictly observed; (2) that the Ministerial decrees determining the precautions to be taken by users of the products and the conditions under which they may be used, be clearly and minutely detailed, billed everywhere, and brought to public notice, and any infringement severely punished; all this to be especially applicable to lead arsenate; (3) that the Government initiate and encourage research, with the object of replacing such dangerous insecticides by methods harmless to man and domestic animals.

In order to prevent food-plants being wetted by drippings from trees and vines above them, the Commission propose to introduce a clause formally prohibiting the use of arsenicals (or other insecticides of Table A of the regulations) for market-gardens and fodder plants.

Gros (A.). **La Mouche de l'Olivier.** [The Olive Fly.] *Bull. Agric. de l'Algérie et de la Tunisie, Algiers*, xix, no. 22, 15th Nov. 1913, pp. 467-468.

Early in 1913 the author drew attention to the enormous proportion of olives in the neighbourhood of Mascara (Oran, Algeria) attacked by *Dacus oleae* and the presence at the same time of a small Ichneumonid. He made a special study of both insects on a completely isolated olive tree which was not treated in any way against the pest in 1912. In that year not a single sound olive was obtained, but in September 1913, though the tree bore well, there was no sign whatever of attack by the fly. He attributes this to the activity of the parasite, and remarks that had the tree been sprayed, the good results would have been attributed to the spray and not to the parasite. The author is not altogether satisfied that spraying *per se* is entitled to the great credit it has obtained.

MACGILLIVRAY (A. D.). **The Immature Stages of the Tenthredinoidea.** *Canadian Entomologist*, xlv, no. 11, Nov. 1913, pp. 367-371.

A general account of the larval habits of the various families of sawflies.

MACKIE (D. B.). **The Philippine Locust** (*Pachytylus* [*Locusta*] *migratoroides*, R. & F.): **Natural Influences affecting its Propagation and Distribution.** *Philippine Agric. Review, Manila*, vi, no. 11, 1913, pp. 538-547, 2 pls.

The chief forces which operate for or against any species may be stated as climate, food supply and enemies. Climatic influences exert the greatest check on locusts. Cold weather causes them to hibernate for extended periods, though this is seldom the case in the Philippines. Winds are important in locust distribution and control. Moderate winds often enable swarms to make long, sustained flights, even crossing from island to island, as from Cebu to Negros. High winds tend to keep locusts near the ground and to prevent extended flights, and severe winds often work great havoc with locust swarms, at times completely annihilating them. Locusts seldom fly during rains. The results of a typhoon are often disastrous to the swarm, the locusts being killed in large numbers by the vegetation being whipped about by the high winds, while the wings of the adults are often torn to such an extent that further flight is impossible, so that the females are forced to lay their eggs on unsuitable ground, which results in a low percentage of them hatching. Floods are important as locust destroyers, especially when large areas on which locusts have oviposited become flooded and quantities of silt deposited over the eggs which effectually prevents the hoppers from emerging. Drought seems to exert a powerful influence in the increase of the pest, since dry weather is inimical to locust parasites. Drought may also induce migrations. Lack of food might also cause the migratory instinct to assert itself. Locust enemies may be classed as predators, parasites and diseases. The importance of birds as locust exterminators cannot be too strongly emphasised; and numerous mammals, reptiles, frogs, etc. and predatory insects attack almost entirely the immature insects and eggs. Of the flies present in the Philippines, the DEXINAE have never been bred out, but have been noted in the vicinity of swarms. The SARCOPHAGINAE are known to parasitise both the mature and young locusts. Two species of Nematodes, or hair-worms, representing the two genera *Gordius* and *Mermis* have been found in the Philippine locusts, the former breeding in water, while the latter is terrestrial. The eggs are deposited in water or on the ground and the young crawl up the vegetation, reaching the host through the mouth with food, and undergoing transformation in the body cavity of the locust. These parasites are probably of little economic importance as locust destroyers. The red locust mites, so far as is known, are no great inconvenience to their hosts. The possibility of controlling locusts through the agency of parasites is very remote since the percentage of parasitised individuals is small. The fungous disease due to *Empusa grylli* has been known to infect locusts, but it is impossible to cultivate this fungus with much success artificially and communicate it to locust swarms. Experiments to test the effect of *Coccobacillus acridiorum*, D'Herelle.

were made, and cultures brought to their maximum virulence in the laboratory were introduced on a swarm of half-grown locusts. The results were practically nil and the contagion did not spread.

Stand der Reblausbekämpfung im Jahre 1912 in den Kantonen Zürich und Thurgau. [Phylloxera control in the cantons of Zürich and Thurgau in 1912.] *Schweiz. Zeits. Obst- und Weinbau. Frauenfeld*, no. 22, 24th Nov. 1913, pp. 349-350.

In 26 communes 4,781 infected stocks were noticed in 247 new points. Five permits were granted to replant previously infected areas with 745 native stocks and two permits for 443 were refused. Twenty-five proprietors renounced re-planting on payment of a lump sum. Replanting with grafts on American stocks is allowed after an interval of at least four years, or eight years in the case of native stocks. As a trial, nurseries for grafted vines were established at Steinmaur and Bülsdorf. In the latter place two new experimental plots were planted with grafted vines. This brings the number of Zürich plots up to 26, all in an average good condition, and the material for these was supplied by the Swiss Experiment Station at Wädenswil. In spite of the vine tax, the vine fund has fallen from £5,218 to £5,055. From 1886 to 1912, 731,895 stocks on an area of about 125,000 acres were destroyed in the Canton of Zürich, and the costs were as follows: Wages, £31,189; Chemicals, £6,563; compensation, £33,971; other expenses, £10,522. The total cost was £82,246. A portion of the cleared land has again been planted with vines, partly as experimental plots with grafted stocks, and partly with native stocks.

The Canton of Thurgau report mentions 333 infected stocks at 59 points. Proprietors were paid £71 compensation for the destruction of 2,591 stocks on an area of half an acre. In 1912, no infection was noticed in the communes of Landschlacht, Gachnang, Aadorf and Altnau. The campaign was begun in 1897 and up to 1912 a total of 410,844 stocks had been destroyed and the proprietors paid £1,574 for the grapes and £5,274 for the stocks. The report does not give any other figures. Five experimental plots of grafted vines have been planted in the former Phylloxera centres.

J. D. **Zum diesjährigen Mottenflug.** [The vine-moth flight in 1913.]—*Luxemburger Weinztng., Grevenmacher*, i, no. 30, 15 Nov. 1913, pp. 517-518.

Experiments lasting from 10th July to 30th August were conducted by Herr Fixmer of Grevenmacher, who found that the flight took place from 18th July to 29th August, thus occupying no less than 43 days. Four beer-traps were used. A total of 1,393 moths were captured, or 348 per trap. According to these figures the system of trapping is a profitable one. The largest number taken was 112, on the 28th July. The great variation in the numbers caught daily does not allow of a useful average being struck and cannot be accounted for. It is hoped that next time the figures will be completed by notes on the weather conditions prevailing. Such experiments are a valuable aid in determining the proper time for beginning control measures.

KRÄNZLING. *Acheta morio*, **ein Sisalschädling.** [*Acheta morio* as a Sisal pest.] *Der Pflanzer, Dar-es-Salaam*, ix, no. 11. Nov. 1913, pp. 568-570.

In inspecting a new Sisal plantation it was seen that a number of healthy one-year-old plants were injured in a peculiar manner not previously observed. At their junction with the stem—and sometimes on their spread—the lowest leaves were eaten into holes about as large as the thumb-nail. Some leaves had been entirely detached while others hung suspended by a few strips. The injury was done by night, and only occurred on those plants growing on ground with a cracked and broken surface. A night-visit to the fields showed the pest to be a cricket, *Acheta morio*. Only young specimens, measuring from 1 cm. to 1·5 cm. in length, were noticed at work, as the older ones escaped on the least alarm. The largest caught measured about 3 cm. Cotton, which was planted in between the sisal, had not been touched. This is only the second insect which has been observed to attack sisal. The author remarks that this occurrence of the insect was quite local and simply due to the favourable conditions provided by the broken soil. In case the pest spreads and causes further damage control will be necessary, but it should be neither difficult nor costly.

BOUVIER (E. L.). **Coccinelles contre Cochenilles.** [Coccinellids to combat Coccids.] *Revue Scientifique, Paris*, 29th Nov. 1913, pp. 673-677.

The author gives in outline an account of the work done by Riley in combating the Coccid, *Icerya purchasi*, in California by means of the ladybird, *Novius cardinalis*, and of the more recent work carried out on the same lines in Italy by Silvestri and Berlese, who have reared parasites of the Coccid, *Diaspis pentagona*. Of several parasites reared, the two most effective seem to be *Prospaltella berlesei*, bred by Berlese, and *Rhizobius lophantae*, reared by Silvestri. The two entomologists are not agreed as to which of these will prove of most use in combating *Diaspis*. Without entering into the discussion of this question, the author records that twigs of mulberry infested with *Diaspis*, which was itself attacked by *Prospaltella*, were submitted to him, and that he found the degree of parasitism to be very high, a fact which speaks in favour of the efficacy of *Prospaltella*. In Nice and eastward to Vintimiglia mulberry trees are attacked by *Diaspis*. Artificial methods of control are held by the author to be only of temporary use, and he thinks that to keep the pest really under control there is no better way than to introduce its natural enemies.

GURNEY (W. B.). **Ironbark Foliage destroyed by Insects.**—*Agric. Gaz. N.S.W., Sydney*, xxiv, pt. 12, Dec. 1913, p. 1076.

Ironbark leaves in Stroud were found to be affected by "Lerp" Insects (PSYLLIDAE), which attack also Eucalyptus trees, sucking the sap. They construct shell-like coverings called "Lerps," under which they grow; after several moults they appear as minute four-winged insects, which lay their eggs on the leaves, on which fresh broods soon hatch. When plentiful they destroy the bulk of the foliage, but usually they are prevalent in numbers which only cause temporary damage. They are kept in check by their natural parasites, minute Chalcid wasps.

ROLFS (P. H.) and FAWCETT (H. S.). **Fungus Diseases of Scale-Insects and Whitefly.**—*Florida Univ. Agric. Expt. Sta., Gainesville, Bull.* No. 119, Nov. 1913, pp. 71-82, 20 figs.

In Florida, fungus diseases have been employed to a very large extent to combat insect pests, for owing to an abundant rainfall and moist atmosphere, the climate is especially favourable to the development of such fungi. These diseases of scale-insects and whitefly are native to Florida, the fungi appearing spontaneously in widely separated orchards. The fungi do not attack trees, and having destroyed the scale-insects or other pests, perish. Careful observation is required in order to find out where the insects are most numerous and to introduce the fungi in the best positions. For small and badly infested trees spraying with some contact insecticide is recommended to relieve the condition temporarily. The fungi may be bought from F. P. Henderson, Gainesville, Fla.; F. Stirling, De Land, Fla.; S. L. Story, Eutis, Fla., the cost in general being from one to three dollars per acre of trees to be treated. Among the fungi-producing diseases, the red-headed fungus (*Sphaerostilbe coccophila*, Tul.) is known to affect a large number of scale-insects. The method of applying the fungus is to tie a piece of fungus-bearing material on a portion of the tree most severely attacked. A dozen pieces or more should be used in every tree according to the degree of infection, and the fungus placed so that it is shaded from the direct rays of the sun. This fungus has been successfully applied by the spore-spraying method. One or two hundred pustules, each of which contain thousands of spores, to the gallon of water would seem efficient for spraying. The white-headed fungus (*Ophionectria coccicola*, E. and E.) seems more effective in citrus orchards in checking the long scale and the purple scale than does the red-headed fungus. The method of application is the same as for the red-headed fungus. Occurring in all parts of the State and having a very general distribution in Florida is the black fungus (*Myriangium duriaei*, Mont.) especially useful in destroying the chaff-scale (*Parlatoria pergandii*). Here again a small sprig with the fungus should be tied to the scale-infested portion of the tree. This fungus is slow in killing the scales but the eradication is generally perfect. The red fungus (*Aschersonia aleurodis*) of the white fly has been applied with great success by the spore-spraying method. From 25 to 50 leaves, having an abundance of pustules on them, are allowed to soak from five to ten minutes in a pail of water, being stirred occasionally. The mixture is strained and applied to the under sides of the leaves. The yellow fungus (*Aschersonia flavocitrina*) of the whitefly is useful only in combating *Aleurodes nubifera* and is applied by spraying; but the brown fungus (*Aegerita webberi*, Fawcett) of the whitefly has been employed with extremely satisfactory results. The cinnamon fungus (*Verticillium heterocladum*) is not very important as a check to scale-insects.

WATSON (J. R.). **Preserving Fungus Parasites of Whitefly.**—*Florida Univ. Agric. Expt. Sta., Gainesville, Press Bull.* No. 217, 29th Nov. 1913, 1 p.

Citrus-growers should be supplied with plenty of red and brown parasitic fungi at the beginning of the rainy season in June, when,

however, fungus material is often scarce. When plentiful, as in November, the grower should lay in a supply for use in the next summer. For this purpose a quantity of leaves are collected, allowed to dry for a day or two, and then put in a tight tin box which is to be kept in a cold storage room where the temperature is usually below 40° F., or in a refrigerator. In some circumstances this fungus material may be dried and kept in a dry condition without losing its power to germinate. In the Experiment Station leaves of red fungus were collected in December, allowed to dry, piled loosely in an open box and kept till July. They were then used to spray the trees and the results were as good as those from spraying with material kept in cold storage.

Hood (J. D.). **On a Collection of Thysanoptera from Porto Rico.** *Insecutor Inscitiae Menstruus, Washington*, i, no. 12, Dec. 1913, pp. 149-154, 1 pl.

The collection of Thysanoptera reported upon by the author contained seven species; it was made by the late Dr. C. W. Hooker in the immediate neighbourhood of Mayagüez, Porto Rico. Six of the species described are recorded for the first time from the island; one species is new and a new genus has been made for it, namely, *Dinurothrips hookeri*. The following species were taken on cultivated plants:—*Heliothrips haemorrhoidalis* on cacao, *Frankliniella tritici* on orange blossom, *Selenothrips rubrocinctus* on cacao and *Gynaikothrips uzeli* on tobacco.

Melle (H. A.). **Lucerne** (*Medicago sativa.*)—*Agric. Journ. Union S. Africa, Pretoria*, vi, no. 6, Dec. 1913, pp. 950-960.

In this paper the author gives the history of this plant from the seed-bed to the market. He notes that one of the great enemies of lucerne at Vryburg is the lucerne caterpillar (*Colias electra*). The perfect insect is a yellow butterfly, the larva being a smooth green caterpillar that feeds ravenously on lucerne and will play havoc with a crop. Lounsbury recommends for the eradication of this pest the cutting of the lucerne when the damage threatens to be great. If lucerne is under irrigation a good method is to flood it continuously, by which means the "caterpillar wilt disease" will be induced amongst the larvae.

Guénaux (G.). **Les Maladies des Chrysanthèmes.** [Diseases of Chrysanthemums.]—*La Vie Agricole et Rurale, Paris*, ii, no. 51, 22nd Nov. 1913, p. 667.

A fly, *Phytomyza geniculata*, lays its eggs in the leaves, the larvae forming mines in the parenchyma. The attacked leaves should be picked off and burned, and the plants treated with a 1 per cent. solution of tobacco juice; they should be sprayed every fortnight subsequently with a 5 per cent. solution. The male of *Calocoris chenopodii*, a Hemipteron, sucks the buds, and the female lays her eggs in the young leaf-and flower-buds. The treatment recommended is spraying with 1 per cent. solutions of tobacco juice, followed by applications of sulphur to the young shoots and buds. Repeat these operations every

fortnight from May to September. *Aphrophora alni*, a froghopper, is very common in summer and lays its eggs in large numbers on the green parts and sometimes on the flowers. The larvae suck the juices of the leaves. This pest is treated in the same way as *Calocoris chenopodii*, but operations ought to be commenced in March. The caterpillars of *Grapholita minutana* eat the collar of the young chrysanthemums and the young shoots, and bore into the flower-buds; the treatment is the same as for *C. chenopodii*. Any flower-buds found to be occupied and deformed by a larva should be picked off and burned.

CSÖRGEY (T.). **Studien über den Vogelschutz im Jahre 1913.** [Bird protection in 1913.]—*Aquila, Budapest*, xx, 1913, pp. 476-502, 6 figs.

The author suggests the pruning of those hedges in which it is wished to shelter birds that only feel safe in bushes where thick cover extends right down to the ground. Instead of pruning so as to obtain a square top and vertical sides, the base of the hedge should be wider than the top so as to allow plenty of light to reach the leaves closest to the ground and promote their growth.

To prevent cats from reaching bird-boxes placed on tree-trunks, barbed wire is wound in a spiral five or six times round the trunk beneath the box. In order that the wire may stand off the trunk it is nailed on small wood blocks about 2 inches thick and the nail driven through such a block can only penetrate the bark and does not do any great harm to the tree.

It is pointed out that bird protection costs very much less than collecting caterpillars, and in spite of most careful collecting the trees are often stripped. In Hungary the aid of the schoolmasters is enlisted in order that the children may learn to understand the usefulness of birds in the economy of agriculture.

ROHWER (S. A.). **Descriptions of New Parasitic Hymenoptera.**—*Proc. Entom. Soc., Washington*, xv, Dec. 1913, pp. 180-188, 1 fig.

Seven new species of parasitic Hymenoptera belonging to the families Ichneumonidae and Braconidae are described so that names will be available for species which have proved of economic importance in helping in the control of injurious insects.

CUSHMAN (R. A.). **Biological Notes on a few rare or little known Parasitic Hymenoptera.**—*Proc. Entom. Soc., Washington*, xv, no. 4, Dec. 1913, pp. 153-160, 2 figs.

Perilitus americanus, Riley, a Braconid parasite of lady-birds was very abundant in Vienna, Virginia, in the autumn of 1912; but although a number of other species of COCCINELLIDAE were present, none but the species *Megilla maculata* and single specimens of *Hippodamia convergens* were parasitised by *P. americanus*. In experiments in the laboratory an adult female *Perilitus* was given access to various species of Coccinellids, including *Adalia bipunctata*, *Anatis 15-punctata*, *Hippodamia glacialis*, *H. convergens*, *Coccinella 9-notata*, *Megilla maculata*, *Cycloneda sanguinea* (=*munda*), and *Hyperaspis* sp., as well as a number of undetermined larvae. All

these were found to be parasitised except *Hyperaspis* sp. The larvae were attacked at any point, while the adults seemed to be attacked only between the segments. The parasite, before ovipositing, perceives the presence of the beetles from a distance of at least an inch, when she shows great excitement by rapid vibration of the antennae and quick movement towards the beetle, then rushing in and giving a quick thrust with her ovipositor. It is probable that the parasite hibernates as a larva within the host.

Paniscus geminatus, Say, was found as an external parasite on an undetermined Lepidopterous larva found under a band on an apple tree.

The Chalcid, *Sphaeropyx bicolor*, Cress., was frequently taken in immature stages as a parasite of *Acronycta clarescens*, Guen. This parasite is gregarious, as many as 30 having been reared from a single host. The total period from the emergence of the larva from the host to the issue of the adult is 20–21 days. From some hosts only males were reared, and from others only females, but from the majority parasites of both sexes emerged, the males issuing one or two days ahead of the females. From 22 hosts there were reared 296 females and 86 males. The parasite hibernates as a larva within its cocoon; frequently it is attacked in the cocoon by an omnivorous hyperparasite, *Dibrachys boucheanus*, Ratz., but it is seldom that all the cocoons in a mass are parasitised. Some eggs of two species of *Acronycta*, one of which feeds on wild cherry, and the other on pear, were exposed to *S. bicolor*; while the parasites took no notice of the eggs, they showed great excitement when on leaves bearing eggs, running rapidly about, dragging their ovipositors over the surface of the leaf and searching minutely with their antennae. No such excitement was shown when uninfested leaves were supplied, a fact suggesting that the search for hosts may possibly be guided somewhat by the scent left by the parent moth on the leaves on which she oviposits. A few days later the *Acronycta* eggs hatched, and the larvae were exposed to the parasites, and were immediately attacked. Older larvae were never touched.

Busck (A.). **Note on a Bark-mining Lepidopteron of the genus *Marmara*, Clemens.**—*Proc. Entom. Soc., Washington*, xv, no. 4, Dec. 1913, pp. 150-151.

In the course of work on forest Lepidoptera the author has bred several specimens of *Marmara fulgidella*, Clemens, from oak. The larva of this insect forms long winding galleries just under the epidermis of young trunks and branches of oak, and leaves the mine early in the spring to spin a small cocoon in some crack in the bark. Similar *Marmara* mines were found less commonly on chestnut; the imago was not secured, but it is thought that it may prove to be the same species or one of the allied forms, *fascilla*, Chmb., or *elotella*, Busck, at present listed under the genus *Gracilaria*.

Knowles (C. H.). **A Report on Scale-Insects found on Bananas in Taviuni.**—*Dept. Agric. Fiji, Suva, Pamphlet* no. 1, 18th July 1913, 3 pp. [Received 19th Feb. 1914.]

As a result of a visit to Taviuni to inquire into the outbreak of scale-insects on bananas in that island the author reports that he came

across no examples of the transparent coconut scale, *Aspidiotus destructor*, but that at least five species of scale-insects were observed on bananas, two of which were also found on coconuts. Most of the coconut estates have bananas growing for food purposes, but the author considers that the cultivation of bananas on Taviuni and particularly among coconuts is attended with very serious risk to the coconut industry. It is stated that plantations of bananas at intervals along the coast provide an extensive area in which the transparent coconut scale might become established, should it ever be introduced into the island, and the present growers should be urged to discontinue the cultivation of bananas. A bunch of bananas infected very plentifully with *A. destructor* was noticed on board ship at Levuka, and the attention of the agent has since been called to the matter and he has promised to give instructions regarding such scaly fruit. The conditions under which bananas are grown are more favourable to the rapid spread of scale-insects than is the case with coconuts. The outbreak of scale in Taviuni and the possibility of the introduction of the transparent scale there, are strong arguments in favour of the early introduction of regulations for compulsory spraying of bananas and for controlling the transport of fruit or plants from areas in which the scale is plentiful. *A. destructor*, which is common on bananas on Vitilevu, is a serious coconut pest in some places, and a menace to the coconut industry, and every effort should be made to eradicate the insect or at any rate to check its spread, particularly to coconut areas. Specimens of all the scales are being sent to England for identification.

LEWTON-BRAIN (L.). **Agriculture in Malaya in 1912.**—*Dept. Agric. Fed. Malay States, Kuala Lumpur, Bull.* no. 18, Oct. 1913, pp. 1-45, 7 tables.

In an account of agriculture in general in Malaya during the year 1912, reference is made to the insect pests of the various cultivated plants. Of the pests of rubber it is stated that on the whole no great damage was done, and that the rubber tree, *Hevea braziliensis*, is generally only attacked by insects when it is weakened by bad treatment or fungus. A mealy-bug was found attacking rubber in Perak, but when the estate was visited, lady-birds and lepidopterous larvae were found preying on the scale, and as no further damage has been reported, it is hoped that the pest is being held in check. Of termites, *Termes gestroi* was controlled by means of the "Universal White Ant Destroyer," which was also used with good results on colonies of *T. carbonarius* and *T. sulphureus*, termites that sometimes damage newly planted stumps. Against *Xylotrupes*, the fork-horned rhinoceros beetle, and *Brachytrypes*, the large cricket, the Carey system of truncated paper cones was found to be effective. *Xyleborus* sp., a small shot-hole borer, was found attacking full grown trees, but usually only where they had been weakened by too close planting or bad pruning. It is recommended that the system of lopping branches overhanging roads and railways be improved; the cuts should be clean, and made as near the trunk as possible; the cut surface should be tarred. Those estates which leave long stumps with hacked ends are sure to become sources of infection to their neighbours. No cases of healthy trees being attacked by the borer have been recorded.

Plant mites have caused some loss in rubber nurseries, but against these the lime-sulphur spray is usually effective.

Coconuts suffered very little from pests, no serious outbreaks being recorded. The caterpillars of *Brachartona catoxantha* attacked the coconut plantations in the vicinity of Batu Gajah; to prevent the spread of these insects the Inspector of Coconuts had the trees for a time almost completely defoliated and the leaves burnt, leaving only those standing that were not affected. As some of the owners objected, and the Coconut Enactment does not contain provision for dealing with this pest, the process had to be arrested, giving the insect the chance of spreading to neighbouring holdings, which it soon did. At the close of the year the Inspector reported that the drastic treatment adopted at first was entirely successful, and that the foliage on the treated trees was exceptionally good, while 20 per cent. of them were again bearing. The untreated trees, he states, were far inferior in appearance. The final checking of the spread of the pest was accomplished by a parasitic Ichneumonid, which was found present in large numbers at the height of the outbreak. A number of trees were defoliated by two pests, the coconut skipper (*Hidari irava*) and the coconut bag-worm (a Psychid): both of these insects are subject to the attack of Ichneumons. A small Hispid beetle was received from Johore; it is a serious pest of coconuts in the Philippines.

During the year one area of about 200 acres of young coconuts was defoliated by locusts (*Locusta danica*, L.) on an estate in Negri Sembilan. The trees at the close of the year practically all showed signs of recovery. The locust first appeared prominently early in the year on grass-land near the West Coast of Negri Sembilan, whence it spread in the flying stage to Seremban and there started breeding. As a rule the insects were quite contented to feed on the lalang grass, and it was only where this had been cleaned up that they took to other plants, such as bamboo, Indian corn, sugar-cane, etc. Experiments are being carried out with a view to finding out the best methods of combating the pest, even although it is at present doing but little damage to any valuable crops.

PARROTT (P. J.) and HODGKISS (H. E.). **The False Tarnished Plant-Bug as a Pear Pest.**—*New York Agric. Expt. Sta., Geneva, N.Y., Bull.* no. 368, Nov. 1913, pp. 363-384, 11 figs., 8 pls. [Received 14th Feb. 1914.]

During some seasons, pears in different orchards in New York are much disfigured with rough and hard corky spots and are liable to be considerably deformed. In 1908, when the injuries were very severe, investigation was commenced to ascertain the identity of the offender and to develop a satisfactory method of control. In the spring of 1909 careful watch was maintained on a number of orchards and it was found that the flowing of sap from young fruits was due to a number of green hemipterous nymphs. From these nymphs adults were obtained and identified as *Lygus invitus*, Say. The fruit damaged by these insects later became covered with hard corky spots. This bug has also been reported on wild grape blossoms, occasionally on the tender leaves of wild apples which have been intertwined with the wild grapes, on the common soft maple (*Acer saccharinum*, L.), on

peaches, and on the young leaves of the sumach (*Rhus canadensis*, Marsh.). In its attack on pears, *L. invitus* shows a preference at first for the tender leaves, puncturing those that are unrolled; the tissues about the point of injury turn black. Later the young nymph thrusts its proboscis deeply into the substance of the tiny pear and on withdrawing it sap flows from the puncture, drying and leaving a blackish spot. There may be many wounds, and severely injured fruit, besides being badly deformed, may be stunted in its growth. None of the leading varieties of pears seem exempt from injury. When attacking blossom-clusters the young nymphs pierce the bases of the unopened buds and the tender fruit stems. The insect's work on peaches has not been observed under natural conditions, but in confinement nymphs of the third and succeeding instars and adults readily attacked the fruit. Illustrated descriptions of the life stages are given. The nymph passes through five stages, attaining wings at the fifth ecdysis. The larvae begin to make their appearance when the trees are coming into blossom. The adults feed for a short time after emergence, when they disappear.

As a protection to the crops, spraying, just after the blossoming period, is recommended. In the Station spraying tests, tobacco extract (40 per cent. nicotin) "Black Leaf 40," ¾ pint of the extract to 100 gals. of water, to which is added 3 lb. of soap, has given the most satisfactory results. The trees should be drenched and both surfaces of the leaves wetted. The removal of wild food-plants is a valuable precautionary measure, the insects being found in largest numbers on wild grapes and to a much less extent on sumach, both common and widely distributed weeds.

Associated with *L. invitus* have been found *Lygidea mendax*, Reut., abundant on pears, plums and apples; *Campylomma verbasci*, Meyer, attacking pear foliage and fruit in a manner quite similar to that of *L. invitus*; *Paracalocoris colon*, Say, found on Bartlett pears; and *P. scrupeus*, Say, commonly associated with *L. invitus* on wild grape, feeding on the tender leaves and blossom-clusters.

J. W. *Polychrosis botrana* **oder der bekreuzte Traubenwickler in unseren Weinbergen.** [The Crossed Vine-moth in our Vineyards.]—*Luxemburger Weintzg., Grevenmacher*, i, no. 31, 1st Dec. 1913, pp. 529-531.

Four *Polychrosis botrana* moths were found among the thousands of *Clysia ambiguella* captured in the 100 vine-moth traps set in 1911. In view of this very small percentage no action was taken at the time, but in the meanwhile *P. botrana* has increased. Among 200 moths caught in 10 traps on the 25th July 1913, ten were *P. botrana*. No further specimens were found in ten other traps set higher up in the same vineyard. Vine-growers must adopt immediate measures to combat this new pest, for even if some observers (Capus, Feytaud, Dufour) are right in stating that where *P. botrana* increases the other species decreases to almost vanishing point, this only means exchanging a bad enemy for a worse.

SOULE (A. M. G.). **Parasite Introduction to Maine.**—*Qtrly. Bull. Maine Dept. Agric., Augusta*, xii, no. 4, Dec. 1913, pp. 10-18, 6 pls.

The first importations into Maine of insect parasites of the gipsy and

brown-tail moths were begun in 1905. The results have been so encouraging that, after eight years' experience of mechanical control, it was considered advisable to attempt the colonisation of parasites to supplement the hand-work in Maine, and last March a laboratory for breeding parasites and observing their work was established in Portland. The work of breeding and liberating thus far has been with *Apanteles lacteicolor* and *Meteorus versicolor*, as enemies of the brown-tail moth, *Compsilura concinnata*, parasitic on both the gipsy and brown-tail moths, and the *Calosoma sycophanta* beetle, also predatory on both insects.

A. lacteicolor is a very small hymenopterous fly, native to most European countries that are infested with the brown-tail moth. These Braconids deposit their eggs under the skin of the newly-hatched caterpillars. In Maine, brown-tail webs, collected in localities known to be infested with *Apanteles* and *Meteorus*, were brought to the Maine laboratory, and placed in feeding trays. As soon as a sufficient number of cocoons of the parasites were obtained from the infested caterpillars, they were carried into the field for colonisation as quickly as possible before the adult had emerged. The cocoons were placed in a water-proof box, nailed to the tree, both tree and box being smeared with tanglefoot to prevent destruction of the cocoons by ants, and here left to emerge. In this way about 15,000 cocoons have been distributed. A sufficient number of *Meteorus versicolor* cocoons were also obtained to establish two colonies of this parasite, the life-history of which is similar in some respects to that of *Apanteles*.

Work was then continued on *Compsilura concinnata*, a Tachinid fly, which deposits beneath the skin of the host caterpillar, the very small maggots which have hatched within the body of the female; these maggots establish themselves within the alimentary canal of their host and in two weeks have attained complete larval development, when they issue from the caterpillar, leaving it dead. Within a few hours they enter the pupal stage, and after a week the flies emerge, the females attaining full sex maturity in two or three days. Several colonies of this parasite have been liberated, and it should prove of great economic importance, as it will attack both the gipsy and brown-tail moths with avidity, and at least sixteen other insects native to Maine are known to serve as its hosts, including the cabbage butterfly and the tussock moth.

The beetle, *Calosoma sycophanta*, preys voraciously on the caterpillars both in its larval and adult stages. The eggs are deposited in the ground and hatch in from five to eight days, the larval life lasting about two or three weeks. The average number of eggs laid during one season by one female beetle is about one hundred. *C. sycophanta* can apparently feed on caterpillars affected with the "wilt disease" without any ill results.

Two egg-parasites will also be imported, *Anastatus bifasciatus* and *Schedius kuvanae*. During the time that is needed for the parasitic and predatory enemies to control the rapidly increasing infestations and assist in restoring "the balance of nature" which has been disturbed, hand-work must be continued and a very active warfare waged against the gipsy and brown-tail moths.

CUSHMAN (R. A.) **The *Calliephialtes* Parasite of the Codling Moth.** — *Jl. Agric. Research, Dept. Agric., Washington*, i, no. 3, 10th Dec. 1913, pp. 211-237, 10 tables, 15 figs., 1 pl.

This parasite (under the names of *Calliephialtes messor*, Grav., and *Ephialtes carbonarius*, Christ) was introduced into California in 1904 from Spain, where it was found by Compere attacking codling moth (*Cydia pomonella*). Up to this time *C. messor* had been mentioned in literature only once since its description; this was by Taschenberg, who in 1863 recorded it as having been reared as a parasite of *Galleria mellonella*, the wax moth. Specimens identical with *C. messor* have been identified as *C. comstockii*, Cress., and *C. pusio*, Walsh, by different authorities. From California specimens of the parasite were sent in 1907 to the Cape of Good Hope and were released there by Lounsbury; but the results were of doubtful value.

The author gives a detailed account of the methods used by him in rearing the parasite, and also of the anatomy of the insect in its various stages and descriptions of its habits in feeding and reproduction. Oviposition began about nine days after the emergence of the female. The stage of the host selected is the full-grown larva in its cocoon; in no case was any other stage attacked. The incubation period varied from 1 to 7 days, depending on the temperature; a table is given showing this variation. *Calliephialtes* is normally a solitary parasite, although more than one egg was often deposited on a single host; when this happened only one larva developed beyond the early stages. The larva begins feeding shortly after hatching, and continues until there is nothing left of the host but the skin, which is finally pushed to the end of the cocoon. The feeding period, from the hatching of the egg to the beginning of the cocoon, varied from 3½ to 18½ days, with an average of about 7¼ days. The larval period in the cocoon varied from 4 to 14 days; the females, after spinning their cocoons, required on the average about 2½ days longer to attain the pupal stage than the males. The pupal period lasts from 6 to 13 days, and again the female requires somewhat longer than the male, to the extent on the average of about 1·66 days. The males outnumbered the females throughout the period covered by the observations, and it was found that the proportion of males increased with each succeeding brood. Of the 57 individuals reared from parthenogenetic eggs all were males.

The adults feed at all times on sweet liquids supplied to them; the males confined their feeding to this sort of diet, but the females frequently fed on the juices of codling moth larvae. Keeping the cocoons in the cold retards their development, which, however, proceeds normally when the insects are removed from cold storage; in the present observations it seemed as if exposure to cold for any length of time had the effect of reducing the activity and vitality of the resulting adults. L. J. Newman, on the other hand, states that the keeping of immature specimens in cold storage for a period of 14 months in no way affected development nor the condition of the adult.

The first female to emerge from hibernation in the spring of 1912 appeared on 3rd May, and the last on 15th May; from the earliest female progeny three complete generations were reared and from the last, two generations. The insect hibernates as a full-grown larva in its cocoon. The females appeared in the spring a few days in advance

of the first adult codling moth, that is, about 40 days before they could, under natural conditions, attack the first brood of larvae of the moth. This would result in a very small first generation of the parasites unless they would attack some other host, since the hibernating brood of parasites would have passed the greater portion of their adult life before an abundance of codling-moth larvae could be found. To determine if *Calliephialtes* would attack other species of insects, larvae of *Enarmonia prunivora*, Walsh, *Euzophera semifuneralis*, Walk., and *Gnorimoschema gallaesolidaginis*, Riley, were placed in the propagating cages with ovipositing females of the parasite. A larva of *Enarmonia* was parasitised within two days, a diminutive male *Calliephialtes* emerging from the cocoon 22 days later; this specimen was much smaller than the normal full-grown larva and it is doubtful whether *Enarmonia* would serve in the long run as an alternate host. Neither of the two remaining species was parasitised. Codling moth larvae containing the internally parasitic larvae of *Ascogaster carpocapsae* were readily attacked by *Calliephialtes*; this always resulted in the death of the earlier parasite and the production of a diminutive adult *Calliephialtes*.

Essig (E. O.). **A New Eriococcus.** *Jl. of Entom. and Zool., Claremont, Cal.*, v, no. 4, Dec. 1913, pp. 179-181, 2 figs.

In this paper the author gives a detailed description of a new scale-insect, *Eriococcus cockerelli*. It occurs in Mexico, and has been reported on "Chino." As this is the Spanish word for quinine the plant probably belongs to the genus *Cinchona*.

Fletcher (T. B.). **Report of the Government Entomologist, 24th April 1912 to 31st March 1913.**—*Operations of the Dept. of Agric., Madras Presidency*, 1912-1913. *Madras*, 1913, pp. 36-41.

The Report, which is the first since the entomological department became an independent section in April 1912, begins with a description of the organisation of the section, its laboratory accommodation and of its facilities for field work. Tours were made in many localities for the investigation of insect pests.

The Deccan grasshopper did considerable damage in the western taluks of the Bellary district in 1911, and a similar attack was expected in 1912. Accordingly cultivators were instructed in the use of bag-nets, and were informed of the life-history of the insect and the preventive measures that may be used. The grasshopper seems to be increasing its area of distribution eastwards and southwards from the northern and western parts of Bellary; on first arrival in a new district it is little noticed as a rule, being in small numbers, but the insects increase rapidly, so that in three or four years they may cause the complete destruction of all the dry crops; after this their power is somewhat abated by the increasing efficiency of natural enemies, chiefly Cantharid beetles. The attack in Bellary in 1912 proved after all to be slight in the western taluks, but at Beeravalli a few hundred acres were found to be heavily infested. Another grasshopper, *Epacromia dorsalis*, was reported as attacking young ragi and daincha crops in Madura: the attack was over before steps against it could be taken.

The cotton-stem weevil (*Pempheres affinis*) does considerable damage to exotic cottons in the Coimbatore district, to which at present this pest seems to be confined. The larva bores into the stem just above the ground, causing a swelling and weakening of the stem, so that heavy wind or rain often cause it to snap across. No successful methods of combat have been devised.

Caterpillars of *Stenachroia elongella* were found webbing earheads of cholam at Hagari: several cases of swarms of caterpillars of *Spodoptera mauritia* on paddy, fodder grass, etc., were reported. *Nymphula depunctalis* was found attacking paddy, mostly in Malabar. *Agrotis ypsilon* was reported as causing great damage to potato plants at Yercaud: spraying with different insecticides, collection by hand of the caterpillars, trapping caterpillars and moths, and laying down attractive bait were all tried; but although large numbers were killed the attack remained so severe that about 80 per cent. of the crop was lost. Investigation of this pest is being continued. The semi-looper moth (*Achæa melicerta*) was taken on castor; sporadic outbreaks of this pest were checked by handpicking of the caterpillars. *Azygophleps scalaris* was found attacking Bengal daincha plants. Caterpillars of *Euplexia conducta* were the cause of damage to safflower; spraying with lead chromate was ineffective, but spraying with lead arsenate quickly checked any further damage. The caterpillars of *Chilo simplex* were found boring in cholam, etc., and those of *Diatræa* sp. in sugar-cane.

Coffee in the Nilgiris was badly attacked by the Pentatomid bug, *Antestia cruciata*. Scale-insects infested Babul (*Acacia arabica*) at Coimbatore; predaceous enemies were present, but these in their turn were attacked by black ants (*Camponotus compressus*). Isolation of the affected trees by cutting away branches, etc., in contact with the ground, and painting a ring of tar and crude oil emulsion (half and half) round the stem kept away the ants, when the natural enemies quickly checked any further increase of the scales. The rice-bug (*Leptocorisa varicornis*) was observed attacking paddy on a Coimbatore farm; it was found by experiment that small hand-nets were more effective than large bag-nets for control of this pest. *Aleurodes bambusae* attacked giant bamboo at Coimbatore. A Fulgorid, *Pyrilla*[illegible] *simplicia*, caused severe but local injury to cholam at Coimbatore in August; as the insect lives protected inside the leaf-sheaths and only sucks the juice of the plants, measures such as spraying are useless: cutting the affected plants for fodder, or flooding the field seem the only practical methods of control.

In November and December 1912, a blue-bottle fly bred in large numbers in the fish-offal along the coasts of South Kanara and Malabar. These flies flew inland and congregated on the spathes of the toddy-palms, sucking up the toddy as it exuded, and discolouring the little that remained with their excrement. The flies also infested the shops of toddy-sellers, causing considerable nuisance. A leaflet in English and in Kanarese on methods of protecting the collecting pots on the trees from access by the flies is being prepared.

Termites (*Odontotermes*) were found attacking young coconut palms at Quilandi, Malabar. The case was interesting because the species doing the damage appeared to be identical with that reported as

building mounds in the adjacent areas; as a general rule, mound-building termites do not attack growing crops.

Cholam suffered from the attacks of mites; the pest was checked by a Coccinellid beetle, which devours the eggs of the mite; no remedial measures have yet been devised; a similar mite, attacking sugar-cane seedlings, was controlled by dusting with flowers of sulphur.

Broods of Eri silkworms (*Attacus ricini*, Boisd.) were kept through the year, but the climate of Coimbatore is too dry to suit the insect. Steps were taken during the year for the improvement of the mulberry silk industry of the Kollegal district. A small number of univoltine mulberry silkworm eggs received from Pusa were reared, but proved unsuccessful.

Two cases of the importation of living insect-pests with sugar-cane sent from Antigua and from Java were met with during the year.

The report closes with some remarks on the future development of entomological work in Madras; it is urged that the present work of the Government Entomologist be divided into three groups:—(a) general routine work, (*b*) research in agricultural entomology, and (c) research in medical and veterinary entomology, and that each should occupy the whole of one man's time; the difficulty of doing justice to any one of these branches is pointed out as being very great for one man alone, while the need for research is emphasised by the citation of cases in which valuable crops have suffered serious damage through a lack of knowledge of the proper means of protection.

CHITTENDEN (F. H.). **The Abutilon Moth.**—*Bur. Entom. U.S. Dept. Agric., Washington, D.C., Bull.* 126, 6th Dec. 1913, 10 pp., 5 pls.

During September 1909, many larvae and pupae of the abutilon moth (*Cosmophila erosa*, Hb.) defoliated okra, hollyhock, and abutilon on the farm of the Virginia Truck Experiment Station. The insect occurred in large numbers and was a serious pest. Hollyhocks and abutilon were attacked throughout the following November. Early in August 1912, the author noticed this species at work on the grounds of the Department of Agriculture, seriously injuring abutilon. Mr. J. F. Strauss collected this species on the 20th August 1912, on okra (*Hibiscus esculentus*) at Washington, D.C. In all cases observed the 12-spotted cucumber beetle (*Diabrotica 12-punctata*, Oliv.) caused some of the damage, while ants also invaded the open bolls, which they were devouring. In the author's experience abutilon is preferred to hollyhock. The insect does not spread to any great extent, and Hibiscus may not prove to be its natural food-plant. A list is given of the various names under which this species has been described; in literature it has generally been mentioned as *Anomis erosa*, Hb. The moth very closely resembles the cotton moth (*Alabama argillacea*).

Experiments were made on the infested abutilon with the following spray formula:—Nicotin sulphate (40 per cent.) ½ oz., whale-oil soap ¼ lb., lukewarm water 5 gals. The soap was thoroughly dissolved in the 5 gals. of water and the solution, after the addition of the nicotin, was thoroughly agitated. During calm, clear weather the plants were sprayed in the morning, while some dew remained on them, and in the form of a fine spray or mist from all sides. Two days after this treatment about 90 per cent. of the larvae were dead. Four or five

observed to be alive were believed to have come from adjoining unsprayed plants. In a few days the plants began to take on a new appearance, putting out a second growth of leaves. Three weeks afterwards, however, another lot of larvae attacked the same plants. When discovered they were full-grown and about to inflict considerable injury. The same solution was applied again; all the insects were eradicated, and the abutilon plants throve free from any pest up to the end of the season. It is believed that some of the insects were in the egg stage when the first spraying was carried out and that they are not affected when in this condition. None of the insects made their appearance in the Department grounds during 1913, showing either the absolute thoroughness of the application, or possibly that they never returned to this particular locality. A bibliography of the principal literature concludes the paper.

PATTERSON (W. H.). **Report of the Entomologist.**—*Government of the Gold Coast. Report Agric. Dept. for* 1912. *Accra*, 1913, pp. 22-25.

The slate-grey leaf beetle (*Adoretus hirtellus*, Castn.) has damaged cacao foliage at Aburi and Assuantsi and in cases of severe attack the leaves are skeletonized. Nothing is known of this insect's life-history. A solution of lead arsenate, 2 lb. in 50 gals. water, forms an efficient spray, but as this is too costly it is proposed to try lead chromate as an insecticide for insects on cacao. The grey moth pod-borer (*Characoma stictigrapta*, Hmp.) does not cause primary damage of importance, as usually the outer wall of the pod alone is eaten, but there is always a risk that the injured area may give saprophytic and parasitic fungi a hold. No instances have been reported as yet, but as the larvae are on the increase it would be well to destroy them when the pods are harvested. "Sankonuabe," "Akate," cacao bark-sapper, and bark-louse are various popular names which are given indiscriminately to two distinct species of Capsid bugs, viz., *Sahlbergella theobroma*, Dist., and *S. singularis*, Hagl., which are both serious pests of cacao. Besides puncturing the bark and causing it to split open and die, these insects also pierce the developing fruits, thus producing "scabby" pods. In addition to this direct damage, there is also grave danger of fungoid infection. The red tree ants of the genus *Oecophylla* are stated to destroy these pests and the author is informed that the native farmers are placing the carton nests in infested trees with favourable results. Thrips have been found in places damaging leaves and pods of cacao. Bag-worms or case-worms are found eating cacao foliage or branches. When these Psychid caterpillars are present in numbers sufficient to cause damage of economic importance the cases can generally be collected by hand and destroyed. The Longicorn stem-borers, *Armatosterna buquetiana*, White, and *Glenea* sp., are rather scarce at present. White ants are reported to give much trouble on some farms.

The *Adoretus* beetle attacks kola in the same manner as cacao. Some of the damage to kola seeds formerly attributed to a weevil, *Balanogastris kolae*, Desbr., is due to a fruit fly (*Ceratitis* sp.), which lays its eggs in the half-developed fruit, generally on the seed testa, on which the larvae feed exclusively. Though comparatively little harm is done, the seeds are not so readily marketable owing to their becoming

discoloured. To reduce the numbers of this fly infested fruits should be buried not less than two feet deep, the soil above them being well rammed down. *Balanogastris kolae* does not interfere with healthy kola fruits and if these are collected as soon as ripe no damage will occur.

Coconuts were injured at Assuantsi by a rhinoceros beetle (*Archon centaurus*, F.). Collection was found an efficient means of control for a time. This beetle has also been reported as breeding in screwpine (*Pandanus*) at Tarkwa. COCCIDAE have not been very troublesome, though *Aspidiotus destructor*, Sign., heavily infested the coconut plantations at Assuantsi. Though much hampered by the dry season, the entomogenous red-headed fungus, *Sphaerostilbe coccophila*, was seen destroying the scales. A predaceous lady-bird beetle, *Scymnus* sp., is being established at Assuantsi to help control. Besides the above-mentioned fungus, others of the same valuable group, viz. *Ophionectria coccicola*, *Aschersonia oxyspora*, *Aschersonia* sp. and an undetermined one, have been discovered. The leaves of young Funtumia rubber in nurseries are often much injured by the Funtumia moth, *Glyphodes ocellata*, Hmp. Parasites do not appear effective in controlling these larvae, as the only one yet found, a Tachinid fly, is itself heavily parasitised by a Hymenopteron. The remedies therefore available are: (1) the picking or squeezing of infested leaves; (2) the dusting of the dew-moistened leaves with a mixture of Paris green 1 lb. and air-slaked lime 6 lb.; (3) spraying with lead arsenate, as recommended for the *Adoretus* beetle of cacao.

The growing crops of corn are not seriously troubled by pests, but enormous loss is caused to the harvested grain by the corn weevil, *Calandra oryzae*, L., which starts its ravages with the ripe grain in the fields. The author hopes that provision will be made for the fumigation of all seeds and plants at the ports. One instance showing the need for such a measure is that a small consignment of mango seed from Ceylon was found to contain a number of mango-seed weevils, *Cryptorrhynchus* sp.

BALLOU (H. A.). **Work connected with Insect and Fungus Pests and their Control.** *Report Agric. Dept., St. Vincent for* 1912-1913. *Barbados*, 1913, pp. 11-17.

Cotton pests. The prompt and vigorous use of Paris green checked the ravages of the cotton worm (*Alabama argillacea*), this being the second time since the re-establishment of the cotton industry that artificial control was necessary. The pest occurs every year, but is combated by its natural enemies, of which the "Jack Spaniard" wasp (*Polistes annularis*) is the most important. In Bequia, one of the Cays, where the worm abounds, there are no Jack Spaniards, or at least very few. Planters must always be prepared to resort to poisons immediately it is found that the caterpillars have not been held in check by their natural foes. The freedom from leaf-blister mite (*Eriophyes gossypii*) appears to the author to be the result of extreme vigilance on the part of the planters and others concerned in keeping down this pest. The Ordinance which provides for the destruction of old cotton at such a time as to cause a complete break each year in the food supply of the mite, seems especially useful. Black scale

Saissetia nigra) is a serious pest at times, but over small areas. It is not parasitised to anything like the same extent in St. Vincent as in Barbados, where the Chalcid, *Zalophothrix mirum*, appears to be a more efficient check on the scale than in other islands. For several years past a small bronze beetle has attacked young cotton in St. Vincent and the Cays, eating the leaves and probably causing a certain amount of injury to the plants.

Coconut pests. Though present in all parts of the island, scales and whitefly only occasionally occurred in such abundance as to indicate any great damage being done. The Bourbon scale (*Aspidiotus destructor*), the tessellated shield scale (*Eucalymnatus tessellatus*), and occasionally the black lime scale (*Ischnaspis longirostris*) occurred in some numbers. The *Eucalymnatus* appeared to be well controlled by the fungus, *Cephalosporium lecanii*. Two species of whitefly occurred, *Aleurodicus cocois*, Curtis, and a species of *Aleurodes*, which frequently is found in company with it. If remedial measures become necessary, cutting out the old leaves and spraying the remainder with a contact insecticide would seem the best course to follow. Judging from some small trials, "Scalo" appears of value for this purpose. Every injury or cut in a coconut palm should be tarred immediately to prevent egg-laying by the palm weevil. This weevil (*Rhynchophorus palmarum*) occurs generally throughout St. Vincent and appears to be greatly on the increase. The clearing of land for cotton-growing is responsible for this. Among the growths cleared were gru-gru palms (*Acrocomia lasiospatha*) which were ordinarily killed by the larvae of the palm weevil after a few slashes with a cutlass had been made in the trunk to aid the female weevil to gain access to the soft part of the stem for the purpose of egg-laying. All plantations of coconut palms must be carefully watched and at the first sign of attack the grub must be dug out and the wound treated with an application of tar. The softer portions of the stem of the gru-gru and coconut palms, cut in lengths of, say, 3 or 4 feet, and split in half, might be used in coconut plantations as traps for the palm weevil. They should be collected after some four or five weeks and destroyed, and a new lot put down for traps.

Arrowroot pests. The arrowroot in all parts of St. Vincent seemed to be healthy and not injured by insects. The most common and best known pest is the arrowroot worm, the larva of a "Skipper" butterfly, *Calpodes ethlius*. In St. Vincent the worms are searched for in the rolled leaves and when found are crushed with the fingers. The rhizomes of arrowroot are often attacked by some insect which tunnels into them, forming cavities which fill with soil and cause much extra work in the preparation of starch.

Lime pests. In all parts of the island citrus trees are attacked by scale-insects; black blight is to be seen on practically every citrus tree, and in the majority of cases in considerable abundance. The green scale (*Coccus viridis*) and the white scale (*Chionaspis citri*) are most frequently seen, while purple scale (*Lepidosaphes beckii*) is unusually rare. Green scale is very common and seems to be parasitised by the *Cephalosporium* fungus to such a degree as to prevent its becoming a serious pest.

Ground-nut pests. The Pentatomid bug, *Edessa meditabunda*, attacks ground-nuts in St. Vincent. The author does not know whether spraying would be profitable, but suggests that experiments

be made with "Scalo." This insecticide is a mixture of whale-oil soap and kerosene, the formula for which has been worked out by Mr. J. C. Moore, Agricultural Superintendent, St. Lucia. The stock mixture is easily diluted in water, the soap holds an unusually large percentage of kerosene, which does not separate out even when kept for a long time. To control the bug, spraying would have to be done at a time when the eggs were hatching or had just hatched when the greatest number of young were present. Ground-nuts are also attacked by several other bugs, and by a small caterpillar which tunnels into the tips of the stems. Mole crickets are also said to damage them.

Cassava pests. The cassava at the Agricultural School was attacked by a species of Thrips which caused a considerable deformation of the leaves, but the author does not believe that it causes very much injury to the crops.

Pigeon pea pests. The white scale (*Hemichionaspis minor*) is controlled to a large extent by parasitic insects and is not likely to cause much injury to pigeon-peas when these occupy the land as a 12-15 months crop, but if allowed to remain a second season they are likely to become seriously infested, even to the point of infecting adjoining cotton fields. No specific directions can be given for the control of the caterpillars which sometimes eat the leaves, or of the weevils which attack the pods; but it is hoped planters will report the first appearance of any of these pests so that more complete knowledge may be arrived at.

Writing after the date of the above report the author mentions that the cotton worm continued to spread but was heavily parasitised by two Chalcid flies, *Chalcis ovata* and *Chalcis* sp., and quickly disappeared. This outbreak drew attention to the desirability of giving still further encouragement to the Jack Spaniard. A trial was made with a small open shed, and a point clearly brought out was that effective shelter from wind and rain is necessary and that the roofs of the sheds should be raised to a height of not less than 7 feet so as to allow the nests to hang well above the heads of labourers who may take temporary shelter in showery weather under the sheds. "Scalo" has been found very effective, and if used at the rate of 1 lb. to a gallon of water was found not to damage any but the very tender plants.

A "Stoppeur" air-compressing pump and four compressed air knapsack sprayers proved very effective. Specimens of the "Furet" duster were also obtained. This is quite the best type of appliance so far used for applying insecticides in powder form. It is worked by one hand alone, and by a simple contrivance it can be regulated to eject a fine, medium, or heavy dust.

Report on the Experiment Station, Tortola, Virgin Islands, 1912-13.
Agric. News, Barbados, 8th Nov. 1913, p. 363.

The heavy rain in October promoted the cotton crop, but insect pests also multiplied, and a severe attack of cotton worms (*Alabama argillacea*) resulted in many districts. To allow peasant growers to deal with this pest, considerable quantities of Paris green were given away. With Sea Island cotton, success has followed selection work with Cameron 106, a strain numbered 12·5 being remarkable in that it is a late bearer, remarkably vigorous, and decidedly resistant to leaf-blister mite.

Insect pests at St. Croix.—*Agric. News, Barbados*, 22nd Nov. 1913, p. 378.

The most important sugar-cane pest in St. Croix (D.W.I.) is the rhinoceros beetle, *Strategus titanus* [see this *Review*, Ser. A, i, p. 254] and the pink mealy bug, *Pseudococcus sacchari*, is of fairly frequent occurrence.

A pest of oranges.—*Agric. News, Barbados*, 22nd Nov. 1913, p. 378.

The occurrence of a pest causing injury to oranges in Dominica, has recently been reported. It is a small moth related to the codling moth (*Cydia pomonella*). The larva injures the fruit by penetrating the skin and feeding in the pulp of the orange, which becomes discoloured and rotten in the vicinity. Even when no further injury is done than the puncture of the skin, the fruit is rendered unsaleable on account of the discoloration at the point of attack and the malformation which often results. This pest was first noticed in 1907, and again in 1908. Remedial measures, and especially spraying with lead arsenate, led to complete control in 1909 and 1910. Since then no records of its occurrence have been received until 1913. The agricultural officers in Dominica state that the attack begins in May or June, the egg being laid on the surface of the fruit. During August, the larval stage is completed and the full-grown caterpillar leaves the fruit (which by this time has fallen to the ground) and enters the pupal stage amongst the leaves on the ground. About two weeks later the moths emerge. What becomes of the insect in the other months is not known. The most successful control resulted from spraying with lead arsenate, applied early in the season, in order that the newly hatched caterpillars may be poisoned as they attempt to eat their way through the orange skin.

Urich (F. W.). **Entomologist's Report.**—*Minutes Meeting Board Agric. on 21st Nov. 1913, Trinidad*, pp. 53-54.

Froghoppers. During the years 1912 and 1913, 51 fields out of 110 on an estate in the Couva district of which a record was kept were affected. In 1912, 25 fields were badly affected, 19 slightly, and 7 had no blight. In 1913, 8 fields were badly affected, 24 slightly and 19 had no blight; 6 fields were badly blighted in 1912 and 1913; 5 fields were slightly blighted in 1913 which were not so affected in 1912. Ratoon canes were mostly affected. *Egg-parasites*:—The survey for the occurrence of egg-parasites is not completed yet, but to the end of September 1913 they occurred in 12 fields and with the exception of one, none of the fields had blight at any time during 1912 and 1913. The single field referred to was only slightly blighted in both years. *Green Muscardine Fungus*:—In 1912, of the 51 fields 14 were sprayed with fungus spores, and in 1913, 16 fields were similarly treated: 12 fields with blight sprayed with spores in 1912 showed no blight in 1913; 7 blighted fields, although sprayed with spores in 1912, showed blight again in 1913, but as a rule the blight was slight, showing that some good was done. *Spread of Froghoppers*: In 1913, five new fields were attacked and all were near fields affected in 1912, showing that the spread of the froghoppers was restricted for the period under review.

Cacao :—Since the last meeting there has not been any increase in Thrips and cacao beetles, the former are still in abeyance and the latter are being caught in places where the trees are in bad condition, either owing to soil or exposure to wind and sun. The author reports that more interest is taken in the control of cacao beetles in the southern part of the Island and small quantities of arsenate of lead are being issued to peasant proprietors.

KRÄNZLIN ( ). **Die Wollausplage in Daressalaam.** [The Mealy Bug plague in Dar-es-Salaam.]—*Der Pflanzer, Dar-es-Salaam*, Oct. 1913, ix, no. 10, pp. 493-507, 6 pls.

In November 1911, the park authorities in Dar-es-Salaam reported that a *Pongamia glabra* tree was apparently the victim of a pest, and inspection showed that all the lebbek trees (*Albizzia lebbek*) were attacked. The author states that the insect is native to East Africa, where its occurrence has been reported before in various places, but it is not peculiar to the region, for Newstead and Willcocks have published an account of its appearance in Cairo in 1909 (*Bull. Entom. Research*, i, pp. 121-141). Its name is *Pseudococcus filamentosus*, Ckll., (*Dactylopius perniciosus*, Newst. and Willcocks). It is not supposed that ants act as carriers of the bug, although they feed on its sugary excreta, but birds are believed to be agents in its sudden appearance in localities far distant from infested areas. Besides *Albizzia lebbek*, which suffers most severely, *Pongamia glabra*, *Pithecolobium saman*, the silk-cotton tree (*Eriodendron anfractuosum*) and citrus trees are complete hosts; but the bug also thrives on the following, though not to so marked a degree: *Sapindus saponaria*, *Chrysophyllum cainito*, *Landolphia* sp., *Tectona grandis*, species of *Ficus*, species of *Bambusa*, *Khaya senegalensis*, *Sterculia alata*, cotton (but Hibiscus remains untouched), *Melia azedarach*, Palms (only on the head when flowering), grasses, *Agave americana* var. *sisalana*, *A. rigida*, *Encephalartus*, *Arum*, *Adansonia digitata*, *Albizzia odoratissima*, *A. procera*, *A. stipulata*, *Acacia catechuoides*, *Forsteronia floribunda*, *Swietenia mahagoni*, *Calophyllum inophyllum*, *Vitex cuneata*, and *Sorindeya*. The author points out that *Sapindus saponaria* may perhaps be placed among the complete hosts. The others only appear to harbour the mealy bug when they are close to a centre of infection. But attention is drawn to the fact that the insect seems capable of adapting itself to plants which at first did not appear suitable. An example of this is provided by the mango trees (*Mangifera indica*) in the suburbs of Dar-es-Salaam, which seemed immune for a long time, but gradually became badly infected. Trees and plants which apparently enjoy immunity are: *Terminalia*, *Poinciana*, *Caesalpinia pulcherrima*, Tamarinds, Casuarinas, all varieties of *Eucalyptus*, *Pandanus*, *Plumiera*, *Peltophorum*, *Santalum*, *Bauhinia*, *Bougainvillea*, *Pithecolobium dulce*, *Syzygium guineense*, *Alamanda*, *Thevetia neriifolia*, *Barringtonia racemosa*, *Anacardium occidentale*, *Adenanthera* and many varieties of *Sterculia*.

The ravages were so sudden and so destructive that immediate and drastic measures were necessary to stamp it out. The enormous cost of spraying big trees infested by so minute an insect could not be faced. It was therefore decided to lop away all foliage and twigs and scrub the bare stumps with a spray-so'ution made up as follows:

lb. of hard soap is dissolved in 1 gal. of hot water; while this solution is still hot 7 quarts of petroleum are added and the whole is stirred till emulsified. When cold, water is added to a total bulk of 20 gals. and the insecticide is ready for use. Grass and undergrowth were removed where present, and some very badly damaged trees were felled. At the end of the chief rainy season the lebbek trees were covered with foliage in which but few of the insects were noticeable. The other trees which had been cut back were free. Those trees and plants which were not complete hosts were now free with the exception of those mangos on which the insect had adapted itself; these were still rather heavily infested. But success was only apparent. Writing one year after the foregoing measures were resorted to, the author states that the lebbek trees were infested anew and the others, though still free, would be infected in time. A repetition of the former drastic method would probably kill the trees. A species of lady-bird (COCCINELLIDAE) has proved a natural enemy and from being rare it is now multiplied exceedingly and is found on every lebbek tree. A bird, one of the common mouse-birds (*Colius*), also preys on the *Pseudococcus*, but is a doubtful auxiliary, as it may carry infection. In view of the fact that lebbek trees are short-lived the author thinks that the selection of other species for re-planting is the only satisfactory solution. The removal of existing *Albizzia* would only anticipate by some years what would be ultimately unavoidable.

BAER (W.). **Die Bedeutung der insektenfressenden Vögel für die Forstwirtschaft.** [The importance of insect-eating birds for forestry.] *Aus der Natur, Leipzig*, July, 1913, ix, pp. 659-671.

It is well known that birds consume enormous quantities of insects. An example of this was provided by two great tits (*Parus major*) which devoured 187 pupae of *Malacosoma neustria*, L., in 13 hours; and again three blue tits (*Parus coeruleus*) and three cole tits (*Parus ater*) consumed 9,500 to 10,000 eggs of the processionary moth daily for a time. Three marsh tits (*Parus palustris*), one cole tit, one long-tailed tit (*Parus caudatus*) and two gold crests (*Regulus regulus*) made away with 1,876 caterpillar of *Bupalus piniarius*, L., in a single day. Recent investigation of this subject is based on very numerous examinations of stomach-contents undertaken by the Biologische Reichsanstalt für Land und Forstwirtschaft, the Forstakademie Eberswalde, the Forstakademie Tharandt, the members of the Bayrische ornithologischen Gesellschaft, the Leipzig Ornithological and Entomological Societies, and many others. The most important works have been recorded by K. Eckstein in his annual reports in the "Allgem. Forst- und Jagdzeitung." The results of this particular investigation show that birds have a preference for certain insects. This may apply either to all birds or only to certain species. In many cases also the investigator is surprised at finding in their stomachs insects which lie hidden and apparently secure from pursuit. The following is a very limited list of some of the chief instances from the wealth of facts collected in this paper:—The starlings and ravens devour the larvae of the crane-fly (*Tipula*) and those of Elaterid beetles, as well as the caterpillars of *Agrotis*. The roller (*Coracias garrula*) devours

Hylobius abietis, a dangerous forest pest; the carrion crow (*Corvus corone*), starling, partridge, etc., also feed on it. The grub of the cockchafer is a general delicacy and one much appreciated by the crow and starling, and it has been proved to be the prey of birds which are not at all suspected of seeking after it, such as the common buzzard, the green woodpecker (*Picus viridis*) and the cuckoo (*Cuculus canorus*). Grasshoppers are a favourite food of practically all birds, and investigation shows that this applies in a large measure to the earwig, while the mole-cricket is also a general victim, and even the eagle owl (*Strix bubo*) pursues it. All the smaller birds devour the oak Tortrix (*T. viridana*). The larch miner (*Coleophora laricella*, Hb.) appears to exercise a very great attraction for the smaller birds, among which the cole tit takes first place in this respect. Some surprising results have been obtained in Austria. On one occasion the crop of a wood-pigeon contained 674 pupae of *Tortrix murinana*. Besides these, which were counted, there was a remainder estimated at about 300. This discovery was followed by that of 122 in a cole titmouse; 200 and 300 in two missel-thrushes; and 53 in a blackcap. Those insects which attack timber are naturally of special interest in forestry. Here again birds are very active. The larger spotted woodpecker (*Picus major*) seeks after the Longicorns, *Saperda populnea* and *Tetropium castaneum*, the big bark-beetle (*Dendroctonus micans*), and the larva of the leopard moth (*Zeuzera*). Passing to the nun moth (*Lymantria monacha*, L.), *Dendrolimus pini*, L., and other serious forest pests, the author remarks that the starling is not always to be relied upon as a means of control, but in many instances this bird has cleared infected areas thoroughly and quickly. The foresters of the See Estate, in Prussian Oberlausitz, consider that the distribution of 600 starling-boxes in their woods once saved these from the nun moth, while neighbouring properties were damaged. It was also noticed that in those places where the boxes were fewest, the traces of the insect were seen the earliest. But the cuckoo is the regular and most formidable enemy of the nun moth. A good example of its activity is reported by Altum who states that in 15 days about 100 cuckoos absolutely cleaned out what threatened to be a dangerous centre of infestation. The much-abused jay (*Garrulus glandarius*) also preys unceasingly on the nun moth, caterpillars, pupae, and egg-bearing females of which are found in its stomach even at times when the pest is thought to be quite in abeyance. Such finds are naturally a practical guide to the forester. The cuckoo is singular in its taste for the processionary caterpillar which it devours with avidity, while other birds strictly avoid it. Indeed it is believed to have nipped in the bud infestations which showed every promise of rapidly spreading to a ruinous extent. Though a very great number of birds decimate the caterpillars of *Dendrolimus pini*, yet here again the cuckoo distinguishes itself above all others. The golden oriole (*Oriolus galbula*) and the jay are also useful in this respect, and one instance is particularly reported where the former effectually checked the ravages of the caterpillars when they appeared in spring. In the case of most sawflies it again occurs that the cuckoo is nearly always the sole enemy of the larvae when the latter are feeding. When later on they are in their cocoons, other birds seek them out. In a small birch wood which had been nearly stripped by *Croesus septentrionalis*, 17 cuckoos appeared and cleared off all the larvae.

These are but a very few of many examples which prove the undoubted value of birds to the forester. That birds destroy useful insects and the parasites of insect pests is undeniable. In this connection it is mentioned that ichneumons are very seldom found in a bird's stomach, but this is only an exception to the general rule, which may sometimes render these feathered allies doubtful auxiliaries. In conclusion, the author points out that both spraying and fumigation destroy the parasite as well as the pest; that the cost of bird protection is low; that birds are able to hunt out concealed pests, some of which, as for instance the oak Tortrix, larch miner, the processionary caterpillar, *Zeuzera*, *Saperda* and wood-ants, are not amenable to mechanical control.

MORSTATT (H.). **Die Wanderheuschrecken und ihre Bekämpfung.** [Locusts and their control.]—*Flugblatt zum Pflanzer, Dar-Es-Salaam*, Dec. 1913, no. 7, 7 pp.

In German East Africa locusts only appear at intervals of several years, far less frequently than in countries farther south. They occurred in 1893, 1898, and 1903 1904, and one swarm alighted in West Usambara in 1905. On the 20th Nov. 1913, shortly before the beginning of the monsoon, some scattered swarms were observed in Usambara, coming from the north-east. They come from the interior of the continent and belong to the yellow or Egyptian species (*Schistocerca peregrina*, Oliv.). Regarding control, the methods and formulae given are those in use in South Africa. Full reference is made to the work at one time carried on by the South African Central Locust Bureau and now performed by the Bureau of Entomology, Pretoria. The paper concludes with a bibliography.

MARTELLI (G.). **Prime esperienze in Italia sull'impiego dei vapori di acido cianidrico contro le Cocciniglie dannose.** [First experiments in Italy with hydrocyanic acid against Coccids.]—*Giorn. Agric. Merid., Messina*, vi, nos. 10-11-12, Oct.-Nov.-Dec. 1913, pp. 169-174.

In Sicily the closeness with which the lemon trees are planted leads to the entangling of their branches, so that fumigation with hydrocyanic acid—the most powerful control known in the United States and Spain—appeared impracticable. An opportunity of testing this method having occurred, the author found that many of the difficulties apprehended did not exist. In fact, the occasions on which the fumigation tent could be used were fairly numerous, as in the case of young trees, trees which have been radically pruned, and trees growing in groups of three or four. The cost of this method has not been worked out, but as the effect of a single fumigation lasts for two years, the author believes that under certain conditions of co-operation among the Sicilian growers, economy may be expected. There is no doubt as to its efficacy. Comparative examination showed that of several hundreds of Coccids found on fumigated plants 97·3 per cent. were dead, whereas only 10·3 per cent. had died from natural causes on plants which had not been treated.

MARTELLI (G.). **La** *Thea 22-punctata*, **L., è solamente micofaga** [*Thea 22-punctata* is exclusively mycophagous.]—*Giorn. Agr. Merid., Messina*, vi, nos. 10-11-12, Oct.-Nov.-Dec. 1913 pp. 189-195.

Thea 22-punctata is an abundant ladybird in all parts of Sicily. In June it completes its cycle in 19-21 days, while in August this takes 24-28 days. According to these figures seven generations may occur from May to October. The author finds that neither the adult nor the larva feeds on aphids, and if aphid-infested leaves or twigs are fed to them they die of starvation. They feed on the conidia and spores of various species of *Oidium* found on the pumpkin, *Plantago* sp., *Beta vulgaris*, various *Brassicaceae*, the oak, the hawthorn, *Clematis vitalba*, *Euonymus* sp., and the vine. The adult is also able to lick the sugary substances excreted by the leaves of some plants and the larva sometimes sucks the eggs of *Thea* itself. The author thus establishes the fact that *Thea 22-punctata* is normally mycophagous.

Rondani recorded the Dipteron *Aphiochaeta* (*Phora*) *fasciata*, Fall. as a parasite of *Coccinella 7-punctata*, L., and the author has found it killing *Thea 22-punctata*, and also attacking *Adonia variegata*, the active enemy of the yellow-green aphid of the capsicum. The chief enemy of *Thea* is *Homalotylus flaminius*, Dalm., a Hymenopteron already known as parasitising other Coccinellids. *Homalotylus* may infest up to 38 per cent. of *Thea* larvae.

THIELE (H. H.). **Coconuts in Fiji.**—*Trop. Agric., Peradeniya*, xl, no. 6, Dec. 1913, pp. 458-462.

Coconut cultivation on the island of Viti Levu was practically given up many years ago, owing to the serious injury done to the leaves by a small moth, *Levuana iridescens*, B.B., not hitherto found elsewhere. Since the end of 1912 a change has taken place in the appearance of the coconuts in most parts of the island and the author thinks the chance of combating the pest successfully has now considerably increased. No control measures are given in the paper.

RUTHERFORD (A.). *Zeuzera coffeae* **(Red Borer; Coffee Borer).**—*Trop. Agric., Peradeniya*, xli, no. 6, Dec. 1913, pp. 486-488.

This insect is widely distributed in Ceylon as a pest of tea. Its presence is indicated by the withering of the leaves and by castings ejected by the caterpillar from its burrow. These castings are oval-cylindrical in shape and yellowish or crimson in colour. If one of the attacked branches is cut open, a tunnel, widening out at irregular intervals, will be found running along its centre. These wider portions are of the nature of lateral galleries that may reach almost to the outside. The width of the tunnel depends on the age of the caterpillar and the galleries of the young larvae are usually straight. The galleries may be so extensive as to girdle the stem; they may also go down into the roots. When full-grown the larva cuts a circular trap-door for the exit of the moth. A variety of insects has been found in the tunnels and in some cases they have been mistaken for the real culprit.

The *Zeuzera* has been found feeding on the following plants in

Ceylon:—Tea, coffee, loquat, cotton, avocado pear, "china apple," orange, Grevillea, teak, *Cassia auriculata*, cinnamon and *Erythroxylon*. In India it is recorded from tea, coffee, sandal and cotton. Being a general feeder it is difficult to deal with. Affected branches should be cut down until untunnelled wood is reached and the larva or pupa in the tunnel killed. Sometimes, as when the tunnel goes below the ground or into the body of the bush, this is not possible. In such a case the pruning should be carried as low down as possible, and the tenant of the gallery killed by prodding with a sharp wire or by putting into the gallery a piece of cotton wool saturated with carbon bisulphide and closing the hole with clay.

RUTHERFORD (A.). **Mites.**—*Trop. Agric., Peradeniya*, xli, no. 6, Dec. 1913, pp. 490-494.

Dry, finely-divided sulphur has been regarded as a specific against mites, but recent work in the United States shows that is not so in all cases. Dealing with the red spider (*Tetranychus bimaculatus*, Harvey) it was found that "sulphur is effective only when the infested surfaces of the plant are exposed to direct sunshine at some time during the day, or to intense reflected heat." In Ceylon, where sulphur gives good results, one or other of these conditions is usually satisfied. Dry sulphur should be applied when the leaves are wet with dew, or, failing this, they should receive a preliminary spraying with water; preferably there should be no wind at the time of application. In Ceylon the cost of applying sulphur at the rate of 10 lb. per acre, preceded by a spraying with water, has been found to be about 2*s.* 4*d.* per acre. Sulphur is now applied in California along with hydrated lime (which may be prepared by adding 32 lb. of water to 100 lb. of quicklime) as the latter causes the sulphur to adhere to the leaves, and also acts as a carrier. The nozzle should throw a washing, rather than a misty, spray. The pressure must not be less than 120 lb. and angle-nozzles or bent rods are necessary in the case of mites infesting the under surfaces of leaves. The Yellow Tea Mite (*Tarsonemus translucens*, Green) is probably the most common and most injurious of the mites affecting tea in Ceylon. It is most abundant on the underside of the leaves, where the small whitish eggs and the mites can be seen even with the unaided eye. The mite occurs chiefly on the two or three leaves nearest to the unopened buds, but also on the latter, on the young stem, and, sparingly, on leaves below the two or three that are most heavily infested. Green records this mite as badly attacking *Cosmos sulphurea*, a composite, and the author has seen the same, or a very closely allied mite, in injurious numbers on leaves and young stems of a small solanaceous climber (*Solanum venustum*). The leaves become bronzed and withered and frequently drop off. This plant was exposed to the full rays of the afternoon sun.

Mites of this group are usually vegetable feeders and many are of great economic importance. *Tarsonemus oryzae*, Targ.-Toz., causes a disease of rice known as "bleaching" in Italy. *T. spirifex*, March., produces distortion in the panicle of oats in France and Germany. *T. waitei*, Banks, is associated with a peach-bud disease in the United States. *T. bancrofti*, Mich., injures sugar-cane in Barbados* and is

[*The Barbados form has been described as a distinct species, *T. spinipes*, Hirst (*Bull. Ent. Res.* iii, 1912, p. 325).—ED.]

present on sugar-cane in Queensland. *T. ananas*, Tryon, is the fore-runner of a disease of pine-apples known as "fruitlet core rot" in Queensland. *T. culmicolus*, Reuter, causes a disease of grasses in Finland. *T. latus*, Bks., was found injuring mango plants in Washington. *T. approximatus*, Bks. MS., and *T. assimilis*, Bks. MS., have been taken on Citrus in California. *T. buxi* is stated by Green to have destroyed every box-tree in the Botanic Gardens at Turin in one season.

The ribbed tea mite, *Phytoptus carinatus*, Green, is recorded in Ceylon from Kegalle, Ukuwela, Nuwara Eliya, Haputale, Peradeniya, Gonakelle and Passara. A bush badly attacked by this mite has every leaf, except the young flush, of a whitish green or a deep bronze-colour, resembling those of copper beech, the discoloration being more marked on the upper surface. The mites are very minute. Watt and Mann give the distribution of this mite as Assam, Darjeeling, Duars and Ceylon.

SCHNEIDER-ORELLI (O.). **Von der Blutlaus.** [The Woolly Aphis (*Schizoneura lanigera*, Hausm.)]. *Schweiz Zeits. für Obst- und Weinbau, Frauenfeld*, xxii, no. 23, 10th Dec. 1913, pp. 351-360, 6 figs.

In 1909, Börner stated that the woolly aphis does not normally lay its winter eggs on apple-trees, but on another host-plant, then unknown. In 1912, Dr. Edith Patch obtained direct proof that this insect changes its host-plant, and she was led to conclude that the woolly Aphis (*Schizoneura lanigera*) and the American elm-leaf aphis (*S. americana*) are not specifically distinct, but simply different stages in the development of a single species [cf. this *Review* A, i, p. 21]. According to this, in the United States the winged forms of the woolly aphis migrate in autumn to the American elm (*Ulmus americana*), where the sexual forms and the winter-eggs are produced. In spring the newly hatched insects and their young suck the elm leaves and cause the characteristic gall formation. Early in the summer the winged forms appear, and return to the apple and similar trees, there parthogenetically producing colonies of woolly aphis. In Europe the American elm is very rarely available for this change, but European species (*U. campestris*, *U. effusa*, *U. montana*) abound, and on all of them especially on *U. campestris* galls like those observed by Dr. Patch are often found. But these galls and their producer (*S. ulmi*) have been known since the middle of the 18th century, long before the woolly aphis appeared. Another point which shows that the two forms are distinct is that Mordwilko and Tullgren have proved that *S. ulmi* regularly migrates to the roots of the currant and gooseberry and there produces colonies of white woolly individuals; further, Dr. Patch has recently stated that the antennae of the woolly aphis (including the American elm-aphis) differ considerably from those of the European elm-aphis. This statement is confirmed by the author, who is satisfied that the European elm-aphis (*S. ulmi*) is a different insect from the woolly aphis of the apple. It remains to be ascertained whether in Europe the woolly aphis passes the whole of its life-cycle on apple, or whether it does actually migrate to elms. To decide

this point definitively winter-eggs must be obtained and the larvae which hatch out in spring must be placed on European and American elms, and also on apple-trees. Details are given of some experiments carried out by the Experiment Station at Wädenswil with the object of breeding winter-eggs for infection tests. The result of these experiments was that about 500 winged individuals produced 200 females and 70 males, which in turn have given as yet 42 living winter-eggs. Though not especially favourable, this is satisfactory when compared with former attempts.

MOORE (B. A.). **The Wheat Louse** (*Toxoptera graminum*).—*Agric. Jl. Union S. Africa, Pretoria*, vi, no. 3, Sept. 1913, pp. 482-492, 12 figs; vi, no. 5, Nov. 1913, pp. 767-772; vi, no. 6, Dec. 1913, pp. 973-977; vii, no. 1, Jan. 1914, pp. 50-60.

In South Africa the first record of the wheat louse is in the 1903 04 report of the Manager of the Potchefstroom Experimental Farm, but according to old farmers the pest had been present for many years before. It is generally distributed over the wheat-growing districts having an altitude of between 3,500 and 5,000 feet. In South Africa there seem to be but two forms of the insect, namely, the winged migratory females and the apterous females; males and oviparous females have not been seen.

All the individuals of the wheat louse reach maturity in about seven days from birth and produce young without fertilisation. During summer the louse lives about 32 days, producing, under favourable conditions, three young daily for a period of 25 days. These are the conditions in the wheat fields about August, September and October. About the end of October or the beginning of November the grain, approaching maturity, becomes too tough for the wheat louse. By this time the winged females have developed, leaving the grain and seeking out grasses upon which they can spend the summer when no cereals are available. If, as a result of drought, there is no grass, the great majority of the aphids die; but some of them are saved by a common ant, *Plagiolepis custodiens*, Sm., which carries them off and places them on the underground stems or roots of the grasses on which they can live. Here they are tended by the ants, which are repaid by honeydew secreted by the aphids.

The wheat louse may be found upon wheat, oats, rye, or barley; during winter it occurs on the main cereal crop, during summer on stray plants. If there are no cereal crops in winter, the louse is found on fescue grass (*Bromus willdenowii*). During summer it frequents different grasses, such as Johnstone grass (*Sorghum halepense*), goose-grass (*Eleusine indica*), sweet grass (*Panicum laevifolium*), teff grass and millet: C. P. van der Merwe mentions also kweek grass (*Cynodon dactylon*) as a host plant. The louse has not been found on *Paspalum dilatatum*, even when growing side by side with infested Johnstone grass.

In the United States a very small Braconid wasp (*Aphidius testaceipes*) successfully controls the wheat louse. In South Africa several species of *Aphidius* occur, one of which multiplies rapidly under favourable conditions. Should the wheat louse not be abundant in the field, the *Aphidius* is able to breed in certain other species of aphids, but directly

the *Toxoptera* become more abundant the *Aphidius* returns to them. An important predaceous insect is the black-spotted ladybird (*Adalia flavomaculata*), which during the larval and adult stages feeds on *T. graminum* and a large number of other aphids; the red-spotted ladybird (*Chilomenes lunata*) and the black ladybird (*Exochomus nigromaculatus*) are also important predators. Of the several different species of Syrphid flies, the larvae of which feed upon *T. graminum*, *Xanthogramma scutellare* is the most important. The lace-wing flies (*Chrysopa* sp.) are of less value. The ladybirds and Syrphids are themselves attacked by parasites; the former by a Braconid wasp (*Dinocampus* sp.) and a Chalcid (*Homalotylus* sp.), the latter by an Ichneumon, *Bassus laetatorius*. The Syrphid is of considerable value as it is the first enemy to appear in an infested field. Owing to the abundance of ladybirds, the value of the *Aphidius* is not so great in South Africa as in America. A ladybird will destroy a given number of wheat lice in a shorter time than will the *Aphidius*, but while it is feeding on the lice it is also destroying the *Aphidius*. After the work of all the parasites and other enemies, a few individuals or colonies of the aphis remain to carry on the species. On Johnstone grass the individuals underground always furnish a source from which new colonies can be formed, and the insects are able to pass through the summer successfully, although greatly reduced in numbers. Under cold conditions, however, the balance is in favour of the wheat louse. The *Aphidius* may be neglected as a means of control below a mean of 55° F., while the louse is still breeding well as low as 50° F., and is not greatly retarded until a mean temperature below 40° F. is reached. Of the ladybirds, the effect of cold seems to be greatest on the *Exochomus*; the *Adalia* withstands the cold much better than either of the other two and is quite active at 50° F. Adult Syrphid flies can almost always be found all through the winter, though they breed very slowly, and their parasite (*Bassus*) persists with them.

As a general rule aphids can be controlled by spraying the plants with paraffin emulsion or tobacco extract and soap, but since a field sprayer would have to be used, this entails a large expenditure which would practically take all the profit on the wheat. On this account the main measures should be directed to prevent the attack. The best prevention of a serious loss is irrigation, and where irrigation is not feasible the ground should be carefully prepared so as to conserve as much moisture as possible. The ground should always be rolled. Under irrigation, fertilisers can be used to make a strong healthy plant able to withstand the attack. Good rotten farmyard manure is the best fertiliser for this purpose, and the best results would be obtained if it were applied in the early spring. Barley is most severely attacked by the wheat louse in South Africa; rye could be better grown than barley, and the variety of oats known as winter oats is only slightly attacked by the louse. Of the varieties of wheat tested for resistance to the louse, "Spring Wheat," "Wit Klein Koren," "Russian Kubanka Durum," "Bombay" and "Minnesota" seemed the best. If an attack starts in one part of a field and the rest of the field is comparatively free, that area should be burned down. If such spots are promptly dealt with the whole field may be saved. The use of the brush drag or the roller is said to give good results, but it is doubtful if they are really worth the labour. Probably the best treatment of an

infested field would be to turn sheep into it and allow them to eat off the grain before it is too far gone. This would save the money expended on raising it to that stage.

FULLER (C.). **Locust Campaign, Cape Midlands, 1913.** *Agric. Jl. Union S. Africa, Pretoria*, vii, no. 1, Jan. 1914, pp. 30-34.

During the early part of the year a few unimportant swarms of migratory locusts were reported from the Cape Midlands. It was found that two different locusts were involved, the true migratory locust, *Locusta pardalina* (*Pachytylus sulcicollis*), and a not particularly harmful species, *L. danica*. The farmers were urged to notify any egg deposits, and reports were received from between sixty and seventy farms. Till the 1st November there was every prospect of a successful issue of the campaign, but by this time it was obvious that the outbreak was far more serious than had been anticipated. Greater success might have been achieved had all concerned taken interest in the work. The locusts then coming to wing largely escaped the attack of locust birds, thus increasing the difficulty. Investigation also showed that the majority of locusts hatched from eggs deposited years previously. Complaints have been made that difficulty was experienced in obtaining poison, but in no case was a depôt further than fifteen miles from a locust-infested farm. The most serious fault has been found with the limited issue of poison arranged for; at first two drums were given to an applicant, but very soon the officers in charge were authorised to issue poison at their discretion. The ineffectiveness of the poison was also a matter of complaint, but investigation showed that the solution had not been properly stirred and as a result a liquid under strength was used, leaving the heavier arsenic compound at the bottom of the drum. The farmers are again urged to co-operate with the Government and report every locust movement.

La Protección a los pájaros útiles a la agricultura. [The protection of birds useful to agriculture.]—*Revista agrícola catalán de San Isidro, Barcelona*, 1913, 69 pp.

This pamphlet is issued by the Provincial Board of Agriculture of Barcelona with the object of popularising bird protection, and stress is laid on the fact that the Chief Officer of the agricultural district of Catalonia reported in 1907 to the Board that the diseases affecting the "Algarroba" (carob bean) at Cambrils (Tarragona) could be avoided by bird protection. The value of reserves in ensuring the increase of birds forms the subject of one chapter, which contains the following figures from a paper presented in 1913 to the International Institute of Agriculture by the Hungarian delegate, M. E. de Miklos de Miklosvar, and dealing with the Hungarian State Preserves in 1911 and 1912. In 1911, the total number of nests was 5,005; of these, 2,077 (41 per cent.) were occupied by useful birds, 502 (10 per cent.) by sparrows, and 164 (3 per cent.) by animals other than birds. Thus it was estimated that some 14,000 useful birds would be bred that year. In 1912, 5,222 nests were inspected; 55 per cent. were found occupied and it was estimated that about 15,000 useful birds would be bred. The International Convention of 1902 is given in full. This

embodies lists of useful and harmful birds with the Latin and Spanish names. The Spanish law on the shooting of small birds is reprinted in extenso; this also contains a list of those species the killing of which is absolutely prohibited.

PHILBROOK (E. E.). **The Brown-Tail and Gipsy Moths.**—*Qtrly. Bull. Maine Dept. Agric., Augusta*, xii, no. 4, Dec. 1913, pp. 1-10, 5 pls.

An historical account is given of the measures taken against the gipsy moth in the New England States. During the years 1907 to 1913 inclusive, the State of Maine has expended 170,000 dollars on the work of suppressing this insect. The eggs are laid on almost any object in July and August, in a mass of 400 to 500, covered with yellowish hairs, looking much like a small piece of sponge. They hatch about 1st May, and the caterpillars are full-grown by about midsummer. Sometime in July or early August they pass into the pupal stage, which lasts about 10 to 14 days. The caterpillars will attack any fruit, shade or woodland trees, and, where abundant, destroy all green vegetation. Coniferous trees are killed after being once defoliated and deciduous trees usually die after four or five defoliations. In the orchard the gipsy moth is readily controlled by painting the egg-masses with creosote in winter and spraying the trees with arsenate of lead (10 lb. to 100 gals. of water) just as the eggs are hatching in spring. Banding has also proved of much value in the work against the caterpillars. Spraying, thoroughly and carefully done according to the rules given by the best authorities, will almost always give good results. If carried out carelessly much damage may be done.

The brown-tail moth is the worst of the imported pests. The home of this insect is in Europe, where it occurs over the entire country. It deposits from 200 to 400 small eggs thickly covered with a mass of brown hairs. The large majority of eggs are laid on the under surface of shade and fruit trees. Those laid in July hatch the following month, and the young caterpillars, feeding in a mass, soon commence spinning their webs, in which they pass the winter. To check this pest the webs on shade and fruit trees should be cut off and burned in the autumn or winter. Fruit trees are best sprayed with arsenate of lead (4 lb. to 50 gals. of water) as soon as the eggs hatch in the late summer. Banding the trees with tanglefoot will in some cases protect the foliage from harm. The native birds are of great value to the orchardist and farmer, since many have been observed feeding on the caterpillars of the brown-tail moth. Prof. Fernald states that toads devour the caterpillars during early summer, and the moths later in the season. Numerous parasites have been bred from this insect.

BÖRNER (C.). **Uber reblaus-anfallige und -immune Reben** [On the susceptibility and immunity of Vines to the attacks of the Vine Louse.]—*Biol. Centralblatt, Leipzig*, xxxiv, no. 1, 20th Jan. 1914, pp. 1-8.

The author gives an account of experiments made by himself in Villers l'Orme, near Metz, by M. Bichon in Pagny, s. Moselle, and by Professor Autelin in Nancy, on the resistance of different vines to the attacks of *Phylloxera*. The most important result of these experiments is to show that the effect produced upon vines by the Lorraine louse

was quite different from that produced by the South of France form. From this the author has concluded that there are two species of vine louse; he has called that found in Lorraine *P. pervastatrix*. In the course of his experiments he proved that *pervastatrix* could not adapt itself to certain vines. According to their behaviour when attacked by this louse, cultivated vines are divided into four groups:—(1) Immune vines; (2) vines which are resistant, but which are subject to slight attacks; (3) vines whose leaves bear small, mostly sterile galls, but whose roots bear nodules and tubercles; they favour the development of the louse, but are to a certain extent resistant; (4) Susceptible vines, on which the normal galls are formed on the leaves and nodules on the roots, which favour the development of the louse and have no resistant power. The first class includes the following:—Pure strains of *Vitis riparia*, *V. rubra* and various hybrids such as *riparia* × *rupestris*, Condere 3306, 3309, Geisenheim 107; *solonis* × *riparia* 1616a; Cabernet × *rupestris* 33a; *cordifolia* × *rupestris*, Geisenheim 19 and 20, etc. Immunity would appear to act as a Mendelian dominant and is transmitted when an immune species is crossed with one that is not immune; it is independent of outside factors such as temperature, moisture, season, and the food supply of the plant. The second class includes the following vines:—*aramion* × *rupestris*, Ganzin Nr. 1; Mourvèdre × *rupestris*, 1202; *riparia* × Gamay, Oberlin 595 and 604, *aramion* × *riparia*, Teleky 143 B, etc. Vines of the third class are the hybrids *riparia* × *rupestris* 101 (Bouisset, Geisenheim, Löhnberg, Richtee), 175 (Geisenheim); *riparia* × *vinifera* 44 (Laquenexy); *solonis* × *vinifera* 35 (Laquenexy); Madeleine royal × *riparia* 33 (Laquenexy). To the fourth class belong the majority of cultivated vines, particularly the European species of *Vitis vinifera* and *silvestris*, pure strains and hybrids of *Vitis labrusca*, the species of the American vines *Vitis berlandieri*, *cordifolia* and *monticola*, and many hybrids.

Tea mosquito.—*Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta*, Part 4, 1913, pp. 98-99.

A fumigating preparation known as sulphur-cake and produced in Hamburg is reported to have been highly successful against the tea mosquito (*Helopeltis*) in Java. When lighted, heavy fumes penetrate into the tea bushes. In view of this, an experiment was made on the Leesh River Tea Estate, but the results obtained were very disappointing. At the time of this experiment the bugs were beginning to spread over the area, and the sulphur-cakes do not seem to have checked them, for three weeks later the Manager wrote:—"....the plot we experimented on is just as bad as the rest. The sulphur had no effect upon it."

Andrews (E. A.). **White ants.**—*Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta*, Part. 4, 1913, pp. 96-97.

A "Universal" white ant machine was found effective on an old colony of a mound-building species of termite which was killing out a Gold Mohur tree. The nest was some five feet in diameter and about the same in depth, and the roots on one side of the tree were entirely

eaten away. The nozzle was pointed down one of the holes, all others being stopped up, and the fumes from four tablespoonfuls of the special compound were pumped in for about half an hour. The nest was opened three days afterwards. For some distance into it a deposit of sulphur showed insufficient combustion, due to lack of air. The upper combs, which were swarming with termites before the experiment, had been completely deserted. The fungus which was cultivated by the insects on the combs was entirely destroyed. Deeper into the nest the combs were full of dead soldiers, workers and young, but some of the nymphs were still alive. The ants have not reappeared, and the tree is doing well.

ANDREWS (E. A.). **Shot-hole borer.** *Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta*, Part 4, 1913, pp. 94-95.

Xyleborus fornicatus, the shot-hole borer of tea, confines its attacks to the sap-wood. The female bores directly into the wood and excavates a vertical tunnel with side branches. At each junction are deposited eggs, and the opening of the side branch is then covered up with a wad of damp saw-dust which produces the necessary conditions for the growth of the Ambrosia fungus, upon which the larva feeds. Its mouth parts are not adapted for chewing wood. The adult stays for some time in the larval gallery, which it lengthens, and in the case of small stems the sap-wood may be almost completely ringed. The chief damage is done by the tunnelling, which interferes with the flow of sap, and by the fungus, which ultimately causes the death of the tree. Dead, dying, or going-back trees are those attacked, and an examination of an infected bush will reveal some injury or disease. Pruning weakens the bushes and makes them more liable to attack. It has been suggested that various poisons, such as carbon bisulphide and benzene be poured into the holes; or that the stem of the bush be painted with some mixture, one of the most recent suggestions being a mixture of chalk and glue in equal parts diluted with water. A layer of this asphyxiates the insects in the galleries and obstructs the laying of eggs. By placing upright poles in the ground among the bushes, the insects may be induced to leave the latter alone, and bore into the former, which can be destroyed. An effective preventive measure is to leave a few shoots unpruned to regulate the flow of sap during the pruning season; and manuring, by making the woody tissues to grow more rapidly, tends to close up the tunnels, thus producing greater resisting power against the pest.

The use of Formalin for disinfecting tea seed.—*Qtrly Jl. Scient. Dept. Ind. Tea Assoc., Calcutta*, Part 4, 1913, p. 107.

As a result of experiments undertaken with the idea of ascertaining the value of formalin against mosquito blight, it was shown that the formalin damaged the bushes when its strength was less than half that at which it killed the young bugs. This confirms the results of experiments made at University College, Cork, with formalin, against green fly and mealy bug, when "any efficacy formalin might possess as an insecticide was more than counterbalanced by its injurious action on the plants." [cf. this *Review* A, 1, p. 18.]

Lovett (A. L.). **Insect Pests of Truck and Garden Crops.**—*Oregon Agric. Coll., Corvallis., Bull.* 91, (Exten. Ser. II, no. 5.) 1913, 39 pp., 13 figs

Truck-growing is followed on a commercial scale in limited areas of Oregon, and the total amount of injury to truck and garden crops by insect pests is enormous. Having the crop in a clean, thrifty, growing condition is the initial step, and the use of insecticides is essential to the highest production of first-class truck and garden crops. To be of most value sprays should be applied before the injury is apparent. The careful rotation of crops; autumn, winter and early spring ploughing; clean cultivation; care as to time of planting; the proper use of fertilisers; the use of trap crops; and the frequent examination of young plants for insect pests; these are all valuable measures.

Among general pests the cutworms (NOCTUIDAE) cause much damage. As a control measure is suggested late summer, autumn, or early spring ploughing, followed by frequent stirrings with the harrow. By thus keeping down all vegetation the caterpillars are starved out. Poisoned bran mash is the standard remedy for cutworms. This consists of 16 lb. of coarse bran, ½ lb. Paris green, ¼ lb. salt and a quart of cheap syrup, mixed with warm water to make a coarse, crumbly mash, which should be spread broadcast over the field several days before the new crop is to appear. Small heaps of the mash may be placed about young plants, such as tomatoes, cabbages and melons. It is advisable to scatter the material in the evening so that it may remain moist for a longer time. Against grasshoppers (ACRIDIIDAE), the use of a disk-harrow or a renovator during late summer and autumn on grass lands adjacent to the truck fields would destroy many egg-capsules. The poisoned bran mash is as effective against grasshoppers as against cutworms, the former being especially fond of the salt in it. The tarnished plant bug (*Lygus pratensis*, Linn.) is a widespread pest. Many of these insects may be captured by sweeping over the plants frequently with an ordinary insect net. A 7 per cent. kerosene solution is very effective against the nymphal forms. Cleaning up fence corners, etc., during the winter and keeping down the weeds about the field are measures of special value for the control of this pest. The wireworms (ELATERIDAE) cause injury by eating the germ of seed grain and excavating tunnels in potato tubers, and other seeds, bulbs and root crops often suffer in a similar manner. As control measures, plough in late summer and harrow the ground frequently; rotate the crops, sowing the infested soil with a leguminous crop for a season or two; on restricted areas poisoned baits of bran mash may be placed under stones or boards about the field. White grubs (*Lachnosterna* spp.) girdle large roots and completely eat off the smaller ones, often killing the plant attacked. As a control measure, plough the soil to a good depth during the autumn, ordinarily from 1st to 15th October will prove the best time. Crop rotation is of some value, and chickens trained to follow the plough will pick up many grubs. Millepedes may cause much injury to garden and truck crops. The treatment recommended for wireworms should be of value. Dressings of a nitrate fertiliser, of salt or of rock lime, will probably be useful; and a soil dressing of 10 parts of sulphur and one part of

tobacco dust will repel them. Traps of sacking, boards, etc., as employed for slugs would be equally effective for this pest. The western potato flea-beetle (*Epitrix subcrinita*, Lec.) is the most serious pest of the potato and tomato in Oregon. The beetle eats small irregular holes in the leaf from the underside and these punctures induce the growth of a fungus. The larvae tunnel into the developing tubers underground and here also a fungus usually gains entrance. The beetle avoids sprayed foliage. Bordeaux mixture applied for the potato fungus acts as a very effective repellent for the flea-beetle. Arsenate of lead, 3 lb. to 50 gals. water, with the addition of 2½ quarts of a good cane-syrup, is suggested as a spray. The under surface of the leaves must be thoroughly sprayed. Strips of paper suspended over the plants on a string stretched the length of the row are highly recommended by one grower. The stalk-borer (*Papaipe nebris*, Guen.) tunnels into the stalks of potato and tomato, eating out the heart. As a control measure, cut out infested stalks and burn them. The tomato worm (*Chloridea obsoleta*, F.), which burrows into the fruit, also attacks sweet corn. Direct hand methods are employed for its control. For the tomato aphis (*Macrosiphum lycopersici*, Clark), rarely occurring in injurious numbers, contact sprays would prove effective.

The bean Bruchus (*Acanthoscelides obtectus*, Say) attacks the pods in the field and is also able to breed in the stored seed. The adult beetle deposits eggs in or on the pods in the field. The grubs hatch and burrow into the beans and are carried into storage. Weevily beans should not be planted, because the grubs will continue development and infest the new crop. A temperature of 145° F. will kill the beetle at all stages and will not injure the germination of the seed. Fumigation with carbon-bisulphide is the standard treatment for stored grain pests. The pea Bruchus does not breed in stored seed, but the losses due to it are very heavy. The adult beetles deposit eggs on the forming pods: the grubs are mature at gathering time and pupate in the stored pea. If the seed is held over a season in a tight bin, the beetles will emerge and die. Kerosene at the rate of ½ gallon to 2 bushels of seed is recommended. Pour the liquid over the peas, stir thoroughly, then spread the peas out so that the oil may pass off. The treatment recommended for the bean Bruchus is equally efficacious for this pest. For the pea aphis (*Macrosiphum pisi*, Kalt.) kerosene emulsion is possibly the best of contact sprays. The brush and cultivator method is used extensively on large commercial plantings in the south. The rows are planted sufficiently far apart to allow a single horse and cultivator to pass between. The insects are brushed from the vines during the heat of the day and the cultivator stirs them into the hot soil where they die. Another arrangement is a long shallow galvanised pan, which is drawn between the rows and the plant lice are brushed into it. The pan should be filled with water and a thin covering of oil added. Of the pests of the cabbage and radish crops in Oregon, *Phorbia brassicae*, Bouché, is the most serious. This insect also feeds on the turnip, cauliflower, celery, rape and kale. They pass the winter as maggots and pupae in and about the roots of their food plants. The eggs hatch in from 4 to 10 days and the young maggots burrow at once into the tender plant. To check the pest gather and destroy all waste roots and refuse tops as soon as the crop is removed.

plough the land to a depth of 4 inches or more; destroy all wild mustard and similar weeds about the field; rotate the crops so that cruciferous plants occupy the soil for not more than one season; the use of a quick-acting fertiliser and frequent surface cultivation are decidedly beneficial. Screening of the cabbage seed-beds is highly recommended by one authority. Five parts of sulphur to one part of tobacco dust, applied in the drill rows with the seed of radish and turnips gave good results. Lime and carbolic acid (1 gal. water, 3 parts milk of lime, and 1 tablespoonful of crude carbolic) applied to the surface soil acts as a repellent for this pest; 1 pint of kerosene to 3 gallons of sand is also recommended. Powdered tobacco placed about the plants at the time of planting and renewed every week has proved useful. White hellebore, 1 part, and air-slaked lime, 10 parts, applied as a dust to the surface soil gives very good results as a preventive. Another serious cabbage pest is the cabbage aphis (*Aphis brassicae*, L.). Contact sprays to be effective must actually wet the insect and several applications are often necessary. Destroy all old stumps and leaves, since it is in these that the aphids pass the winter. If plants are infested in the seed-bed they should be either dipped at transplanting time or fumigated. Whale-oil soap, 1 lb. to 8 gals. of water, makes a very effective dip and equally good is home-made fish-oil soap, the formula for which is caustic soda (1 lb.; water, $1\frac{1}{2}$ quarts; and fish-oil, $5\frac{1}{2}$ lb. For use, take 1 lb. of soap to 8 gals. of water, and dip only the infested parts. Infested plants dipped for 2 or 3 seconds in water heated to 122° F. showed that all the aphids were killed and the plants were uninjured. Kerosene emulsion as a 7 per cent. solution is possibly the best of aphis sprays. "Black Leaf 40," 1 part to 1,600 parts of water, with the addition of 1 lb. of whale-oil soap to 20 gals. of the solution has given excellent results. *Diabrotica soror* and *D. trivittata* attack cucumbers and melons and are also serious pests of beans, potatoes, turnips, etc. It is seldom that any one treatment will prove entirely effective. The "trap crop" method has given excellent results. Screens covered with cheese-cloth serve very well for the protection of small plants. Fine wire screen cones are also recommended. All old vines and trash in the field should be destroyed, as well as the wild gourd. For very small plants arsenicals as a dust should be used, and for older plants zinc arsenite, 1 lb. to 60 gals. of water, can be used as a spray. Lead arsenate paste, 3 lb. to 50 gals., is also good. The onion thrips (*Thrips tabaci*, Lind.) is becoming a serious pest in the onion districts. While onions suffer most, cabbage and kale, cucumbers, tomatoes and several ornamental plants are also subject to attack. The injury is due to a rasping of the surface of the leaf, which then wilts. "Black Leaf 40," 1 part to 1,600 parts of water, with the addition of whale-oil soap, 1 lb. to 100 gals. of the solution, will control the thrips; kerosene emulsion as a 7 per cent. solution is equally good. The onion maggot (*Pegomyia ceparum*, Bouché) attacks the onion much as the cabbage maggot attacks the radish, and similar control measures are effective for it. The paper concludes with a number of formulae for useful insecticides.

SAHILLE (E.). **Sobre el gusano de la peras y manzanas.** [The pear and apple worm.]—*Revista de la Asociación Rural del Uruguay, Montevideo,* Aug.-Sept. 1913, pp. 359-362.

The author states that in Uruguay the moths of *Cydia* (*Carpocapsa*) *pomonella* are best destroyed by bonfires lit in the evening around pear and apple trees when in blossom; or again, a large box provided with apertures, containing a light and smeared inside with honey or syrup, makes an effective trap. Against the grubs the author recommends preventive spraying. As Paris green is expensive, the use of Scheele's green (copper arsenate) is suggested. As a poison it is equal to Paris green, and costs only half the price: being in extremely fine powder it very easily remains in suspension in liquids.

JACK (R. W.). **Two Ladybirds Injurious to Potato Plants.**—*Rhodesia Agric. Jl., Salisbury,* xi, no. 1, Oct. 1913, pp. 77-82, 1 pl.

Ladybirds are in general of great value to farmers, constituting a powerful control against scale-insects and plant lice. There is, however, one genus of ladybirds, *Epilachna*, of which all the known species are exclusively plant-feeders. In Southern Rhodesia two species, *E. dregei* and *E. hirta*, normally feeding on certain wild solanaceous plants, have caused serious damage to potato crops. The eggs are laid in clumps, varying from four or five eggs to upwards of thirty, on the under surfaces of the leaves. Here the larvae hatch and feed on the softer portions of the leaves, as do also the adults. The latter live over the winter and probably egg-laying commences as soon as the warm weather approaches. It is probable that only two broods develop on the potato crop in Rhodesia, the first being laid in December, the adults appearing about the end of January; the second brood maturing early in March. If food is available in November three broods can doubtless mature. There is no doubt that potato diseases are spread and assisted by these insects.

Turkeys, when experienced in the work, are reported to be very effective in destroying this pest in the field. Much good can be done by killing the beetles by hand. On a larger scale spraying with an arsenical compound is the most effective remedy. The arsenic may take the form of arsenate of lead, 3 lb. to 50 gals. of water; or Paris green 1 lb., quick or fresh water-slaked lime 2 lb., water 160 gals., or arsenite of lime, which is by far the cheapest arsenical spray in Rhodesia, and as effective as the others. Arsenite of lime can be prepared from arsenite of soda and quick or water-slaked lime. The formula is, arsenite of soda 4 oz., lime 11 lb., and water 50 gallons. The arsenite of soda is best dissolved in a little boiling water and made up to 25 gallons in one barrel. The lime is then slowly slaked and made up to 25 gallons in another barrel. The arsenite solution can now be added to the lime water and the whole stirred thoroughly. The lime solution should be strained. A hundred gallons of a mixture of arsenate of lead to be effective costs 7s. 6d., while a hundred gallons of arsenite of lime costs only 8d. This latter mixture should be kept stirred during use.

Importation of Plants Regulations; Government Notice no. 259 of 1913, 21st Aug. 1913.—*Rhodesia Agric. Jl., Salisbury,* xi, no. 1, Oct. 1913, pp. 180-185.

The regulations made in this notice cancel previous regulations and apply generally to any plant imported into Southern Rhodesia. The regulations declare that any plant or packages of plants may be examined by an Inspector, and when deemed necessary as a precautionary measure against the introduction of any insect pest, may be treated by the Inspector at the expense of the consignee or addressee, an examination fee of 1s. per each class of plant included in a consignment will be charged, and 5s. for each use of the fumigating chamber. If the Inspector considers it necessary, the package may be destroyed, no compensation being paid. After the examination a certificate will be issued for the package which must be produced at any time if required. One clause forbids the introduction into Southern Rhodesia of any plant from places outside British South Africa, except by post or through the port of Umtali or the ports proclaimed under section 8 of the "Agricultural Pests Act, 1911." No person may introduce into Southern Rhodesia from any place outside British South Africa any eucalyptus, acacia or coniferous plant or any living portion thereof with the exception of seeds; any stone-fruit tree or any living portion thereof which was grown or produced in any part of North America in which either of the diseases known as peach yellows or peach rosette exists; any live peach stones; any stone-fruits in their fresh state; any stocks whatever except those of the following, which may be imported in bulk only, that is not less than 1,000 almond, pear, plum, persimmon, cherry, Northern Spy and other apple stocks accepted as being resistant to the attack of woolly aphis (*Schizoneura lanigera*). The introduction of grape vines or other plants of the family Vitaceae, sugar-cane, plants cultivated for the production of rubber, tea plants and coffee plants, shall be made under the direct supervision of the Government; this limitation shall not apply to the seeds or fruit, except those of coffee. Any flowering or ornamental plant or any cotton seed may be introduced with special permission of the Director of Agriculture. The introduction for any one person shall be limited to 100 trees and 1,000 cuttings. Potatoes may not be introduced into Southern Rhodesia from outside British South Africa, unless duly certified and accompanied with particulars as to the place in which they were grown, etc.

MONTELLO (H.). **Enfermedades del ciruelo.** [Diseases of the plum-tree.]—*Gaceta Rural, Buenos Aires,* xii, no. 76, Nov. 1913, pp. 333-337, 7 figs.

Diaspis pentagona is one of the enemies of the plum-tree in the Argentine and is best combated with lime-sulphur or "acaroina." Two applications are required during the winter, in May and in August, and in spring, spraying must be effected on the appearance of the larvae. The acaroina solution (10 to 15 parts of acaroina mixed in 100 parts water until emulsification takes place) is preferable to lime-sulphur because of its greater wetting power; it also kills the insect

instantly. It is best applied in June, and spraying must be done on the same day as the emulsion is made in order to ensure uniformity. To control *Scolytus rugulosus* efficiently the parts attacked must be removed and burned; if the whole tree is infested it is best to root it up and burn it. *Cydia funebrana*, commonly known as the plum worm, may be dealt with by gathering the fallen fruit and feeding them to pigs.

La falsa tiña de las colmenas. [The bee-moth.]—*Gaceta Rural, Buenos Aires*, vii, no. 77, Dec. 1913, pp. 463-464.

The damage done by bee-moths increases with the heat and dryness of the breeding season. During the day they settle near the hives and at sunset fly round them; it is thus easy to collect or to net them. In 1902, bee-keepers in the district of Yerua lost 80 per cent. of their hives. If the trouble is severe it is best to remove the bees and fumigate the infested hives with sulphur.

NORRIS (F. DE LA MARE). **Locust work in Selangor; Progress Report for October.**—*Agric. Bull. Fed. Malay States, Kuala Lumpur*, ii, no. 5, Dec. 1913, pp. 124-125.

In the neighbourhood of Kajang the swarms were comparatively small and scattered, and the district was practically free from hoppers by the 20th October. During the month of October approximately 465 kerosene tins of locusts, representing about 101 swarms, were destroyed. Around Kuala Lumpur the swarms were large, the apparatus being barely sufficient to cope with them. Considerable damage of a temporary character was done to gardens and hedges. By the 28th October few hoppers were present. The month's catch was 1,820 tins, representing 83 swarms in all. In the Ulu Selangor district swarms were large and in situations where they were difficult to deal with, but very satisfactory results were obtained and it is believed the locusts in this neighbourhood have received a check which materially decreases the possibility of their threatened advance into Perak. The chief centres of work were Rasa, Batang Kali, Bukit Cheedong, the Kuala Selangor road, and Serendah. By the end of the month the work was finished; the catch being 3,030 tins, representing 50 swarms. In addition to this work done by the Special Assistant and the Government coolies, the Malays caught approximately 12,000 tins of hoppers for a reward of 1s. 2d. per tin, in this district. In a table showing the work done from 6th August to 31st October the total number of swarms dealt with in Ulu Selangor, Kuala Lumpur and Ulu Langat is given as 392, the total catch amounting to 24,758 kerosene tins.

NONELL Y COMAS (J.). **Las plagas de los Alcornocales en la Provincia de Gerona.** [Cork tree pests in the Province of Gerona.]—*Rev. Inst. Agric. Catalán S. Isidro, Barcelona*, lxii, no. 23, 5th Dec. 1913, pp. 355-358, and Monograph.

Lymantria dispar and *Coroebus undatus*, the two most serious pests of cork plantations in Spain, have been studied by a commission

which visited first the plantations o' Romañá and other townships of the Selva and then proceeded to Darnius y Agullana on the frontier. In this article an address given by one member of the commission, Don Jaime Nonell y Comas, is freely quoted, while the Monograph contains a full record. *L. dispar* lays about 500 eggs in sheltered places on the branches and covers them with hairs from its abdomen. The eggs remain throughout the winter, and hatch in April and May. For 7 to 10 days the young caterpillars remain motionless, grouped together in large numbers; they then become active and extraordinarily voracious until the beginning of July, when they spin an imperfect cocoon in the rugosities of the bark. The adults emerge about three weeks later and shortly afterwards the females lay their eggs. The enormous voracity of the larvae is responsible for the rapid defoliation of the trees attacked, those preferred being he evergreen-oak, oak, cork-tree, plane-tree, and fig-tree. *Coroebus undatus*, a beetle of the family BUPRESTIDAE, appears between the middle of June and the middle of July. A few days afterwards the female lays her eggs in cracks in the bark of the lower trunk and roots. The larvae bore inwards and establish themselves beneath the last-formed corky layer. After personal observation Señor Nonell y Comas does not agree with those agricultural entomologists who hold that the life-cycle of *C. undatus* lasts a year; according to him it lasts two years. In the second fortnight of August the larva penetrates the liber and provokes an extravasation of sap through its gallery. This causes a black spot on the exterior of the trunk. The discoloration may only be temporary, but if the flow is abundant the sap spreads between the mother bark and that last formed and causes the latter to lose its good qualities. These spots were found to be a sure indication of the presence of the insect. It is hoped that the knowledge acquired may prove of use in reducing the ravages of these pests by leading to an encouragement of their natural enemies. Bird protection is an important point.

FEYTAUD (J.). **La Cochenille de San José.** [The San José Scale.]—*Bull. Soc. Etude Vulg. Zool. Agric., Bordeaux*, xii, no. 6, Dec. 1913, pp. 174-178, 2 figs.

Although the San José scale has not yet been found on trees in France, the author thinks it well to be on guard against this highly polyphagous pest. Fortunately *Aspidiotus perniciosus* has many natural enemies, such as the Coccinellids, *Microweisea misella* and *Chilocorus similis*; the parasitic Hymenoptera, *Aphelinus fuscipennis*, *A. mytilaspidis*, *Aspidiotiphagus citrinus*, *Anaphes gracilis*, *Prospalta aurantii*, *Ablerus clisiocampae*, etc., and the fungus *Sphaerostilbe coccophila*. Efficacious control methods are known, but they are difficult to apply to all the trees attacked. In the case of badly-infested and injured trees uprooting and burning is the only radical measure. The lime-sulphur formula given contains 5 parts by weight of quicklime, 3 of sulphur, and 100 of water. Hydrocyanic acid is mentioned as being very efficacious, but requiring costly apparatus and difficult to apply. Some Coccids native to France might be taken for *A. perniciosus*. According to Dr. P. Marchal they are: (1) *Aspidiotus ostreaeformis*, very common in France and abundant

on fruit trees near Paris; (2) *Diaspis ostreaeformis*, which is less frequent; (3) *Mytilaspis pomorum*, which may be very injurious to apple-trees.

Concorso per un rimedio contro le tignuole della vite. [Competition for a remedy against the vine moth.]—*Riv. Vitic. Enol. Agrar. Conegliano*, xix, no. 23, 1st Dec. 1913, pp. 541-547.

The prize of £24 was competed for by four entrants, the application and results of whose methods were inspected by a jury composed of five experts, one being the representative of the Ministry of Agriculture. The first competitor used two ordinary soft clothes-brushes, one being held under the bunch of grapes which is lightly tapped and stroked with the other brush. Ninety per cent. of the larvae in the webs are wounded by the bristles and the webs disappear from the grapes. Two women can clean 1,700 vines in a 7-10 hours' day. Their labour costs 3*s.* 4*d.* per day at the rate of 1*s.* 8*d.* each, and the outlay for the brushes is nominal, as the wear is insignificant.

The second competitor powders all the bunches with copper sulphate at a strength of 10 per cent., which he calls "Antisettico." The application must be made in the second half of May. Its object is to keep the moths away from the grapes, thus preventing eggs from being laid on them. The succeeding treatment consists in dipping all the bunches marked with the webs of the vine moth into a glass containing an "antiseptic" solution invented by the competitor. This operation is performed after the flowers have been fertilised and immediately the corolla has fallen. Towards the end of July the powdering is repeated on the appearance of the moths of the second generation. A quart of the liquid, sufficient for about 1,100 vines, costs about 11*d.* and it is non-poisonous. Including labour, the costs would amount to about 5*s.* when compared with the first method. The cost of the powder is not included, for it contains sulphur and copper and thus serves also to combat peronospora and oidium. One hour after immersion all the larvae were dead, and on inspecting the grapes some time afterwards these were found to be uninjured by the solution

The third competitor used lead arsenate, but instead of spraying he dipped the bunches in a 2 per cent. solution. This was done on the 8th June, when the larvae had appeared, but had not yet enclosed themselves in their webs. On 19th June the jury could find no trace of either larvae or webs on the vines treated, whereas both abounded on the untreated ones. To be effective the operation must be carried out on the first appearance of the first larvae. Using the same labour as before the comparative cost would be about 6*s.*

The fourth competitor employed a special powder called "Arxolea," which is supposed to be effective against peronospora, oidium, and the moths. No Bordeaux mixture or sulphur was used in the experimental plot, but its condition was found equal to that of vines treated with Bordeaux mixture and copper sulphate. As regards the point under investigation—the control of the vine moth—there appeared to be no difference whatever between treated and untreated vines.

The conclusions arrived at by the jury are as follows:—(1) The methods of the first two competitors are efficacious against the larvae

of the first generation, but they cannot prevent these from damaging the flowers, because they can only be applied after flowering. The first method appears cheaper and quicker than the second. (2) The method of the third competitor gives good results against the larvae of the first generation, provided it be applied at the proper time, that is, before the larvae enclose themselves in their webs. Its disadvantage is however the poisonous nature of the liquid and the danger to which it exposes the user. (3) The "Arxolea" of the fourth competitor has neither a preventive nor a curative action on the moth. (4) None of these methods against the larvae of the first generation have influenced succeeding generations, and it may be assumed that in August the treated and untreated grapes were equally attacked. The prize was not awarded because no system can be efficacious unless it protects the young fruit as well as the flowers. It is suggested that the experiments be repeated on a larger scale next year, when any effect on the larvae of the second generation would be apparent.

Tairov (V. E.). **Изъ исторіи филлоксернаго вопроса въ связи со введеніемъ американской лозы въ Россіи.** [History of the *Phylloxera* question in connection with the introduction of American vine-stocks into Russia.]—*Odessa* (?), N.D., 18 pp.

The author reviews the history of *Phylloxera* in Europe, with special reference to the importation of American vine-stocks with a view to the production of *Phylloxera*-proof vines. As to Russia, *Phylloxera* was first discovered in 1880 in the western part of the south coast of the Crimea; in 1881 it appeared in Caucasia, in the vineyards near Suchum; and in 1886 it was also noticed in Bessarabia. It was established that both into Crimea and Bessarabia the pests were imported with vine-stocks obtained from Erfurt at the beginning of the 'seventies of last century. For a long time many Russian experts, principally Prof. A. O. Kovalevsky and I. A. Portchinsky, were amongst the opponents of the introduction of American vine-stocks into Russia, and they advocated radical remedies, aiming at the destruction of the pest; the Russian Government was also unfavourable to this new remedy, and it was only in 1892 that the official view on the subject underwent a change, and the prohibitions against the importation of foreign vine-stocks were gradually withdrawn.

In Bessarabia, where some years ago vineyards occupied an area of about 20,000 acres, more than one-third of them were suffering from *Phylloxera* in 1907. The first experiments with exotic stocks were started there about 15 years ago, and at the time of writing (?) it is estimated that only about one-tenth of the vineyard area in that Government is attacked. In the Government of Cherson some 1,300 acres are affected by *Phylloxera*; the growing of American vines started only a very few years ago, although in one part they were introduced in 1896. The Government of Taurida is still free from *Phylloxera*; American vines were introduced some 20 years ago, but some of the nurseries were afterwards abandoned. In Bessarabia and Cherson the Zemstvos assist the population by importing young stocks and distributing them amongst the vine-growers on easy terms, by securing the services of special vine instructors, by keeping experimental nurseries, etc. The author, who from the very beginning was an advocate of exotic vine-stocks as the best remedy against *Phylloxera*,

urges the necessity of their more extensive use, in order to save the vine-growing industry, especially in Bessarabia and Transcaucasia, from the losses caused by this pest. He also recommends the foundation of special schools for vine-growers, of vintage stations, etc.

MUNRO (J. W.). *Tinea tedella*, Cl., **in Aberdeenshire**.—*Entomologists' Monthly Magazine, London*, 2nd series, no. 289, Jan. 1914, p. 15.

The moth, *Tinea tedella*, Cl., is proving harmful to young spruce trees in Haylehead Woods, near Aberdeen. The larvae eats into the needles at the tips of the side-shoots and sometimes spins them together.

HILBERT (R.). **Über das massenhafte Auftreten von** *Coccinella quinquepunctata*, L. [Appearance of large numbers of *Coccinella quinquepunctata*.] *Zeits. für wissen. Insektenbiologie, Berlin*, x, no. 1, 20th Jan. 1914, p. 32.

The author records the finding of numbers of specimens of *Coccinella quinquepunctata*, L., in the autumn of 1912 along the Sämland Coast, and also on the banks of the Spiedingsee. The reason for the presence of the beetles in such large numbers in these situations is quite unaccountable, as weather conditions during the summer had been, so far as can be judged, unfavourable to insect life, and there was no evidence of a particularly abundant food supply. The author refers to Prof. Werner's records of the finding of similar numbers of *Coccinella septempunctata* and *C. convergens* [see this *Review*, Ser. A, i, 1913, p. 548].

TRÄGÅRDH (I.). **Om lönnvecklaren** (*Tortrix forskaleana*, L.) *Meddelanden fran Centralanstaltens Entomologiska Avdelning, Uppsala*, no. 15, 1914.

A review of the literature leads the author to the conclusion that the larva of *T. forskaleana* has been confounded with that of *T. bergmanniana*, probably owing to a misinterpretation of a statement of Boisduval. Of all authors dealing with this species only Wilkinson and Wallengren give a correct description of it, all the others quote the incorrect description of Bouché. From this mistake arose the statement that *forskaleana* attacks roses, which the author is inclined to disregard, as no one of the authors who give this food-plant appears to have a real knowledge of the larva. The food-plant is the maple, the leaves of which are rolled by the larva. The life-history takes, in the neighbourhood of Stockholm, the following course. The larvae were observed in the end of May, pupated the 10th of June, the first moths appearing the 8th of July; there is only one generation a year, the eggs, laid probably on the stalks or the keys, hatching in the beginning of August, the larvae feeding on the keys until autumn, when they hibernate somewhere until the middle of May of the following year, when they again curl the leaves.

This procedure is described and a detailed description is given of the larva, the pupa and the mode of pupation, with numerous figures.

TRÄGÅRDH (I). **Krusbärskvalstret** (*Bryobia praetiosa*, K.)—*Meddelanden från Centralanstaltens Entomologiska Avdelning, Uppsala*, no. 17, 1914.

A review of the literature regarding this mite leads the author to the following conclusions:—All the different species described by Koch, G. Canestrini and F. Fanzago, Berlese, Tjomas and Garman, under the names of *praetiosa, speciosa, nobilis, gloriosa, ribis* and *pratensis* must be referred to *praetiosa*, K., being mere variations and different instars of that species.

The differences as regards the shape of the cephalothoracic plate and the hairs on the front femora, on which Berlese bases his two species, are not specific, but only variations, as proved by Oudemans and the author. The arguments which Thomas and v. Hanstein bring forward to show that *ribis* is different from *praetiosa*, namely, that Koch mentions only 4 dorsal hairs on the latter, are not valid, because Koch in his diagnosis of *nobilis* distinctly states that the latter has the same three pairs of hairs as *praetiosa*. Von Hanstein's argument that *ribis* is different from *praetiosa* as described by Canestrini, because the latter author has found larvae and nymphae of *praetiosa* as late as July, whereas the propagation in Germany takes place in April and May, is not valid, as Marlatt has shown that in the United States the breeding period is greatly influenced by latitude and climatic conditions.

B. praetiosa is spread all over Europe, southwards as far as Egypt, northwards to the Arctic regions, and occurs in the United States. In Europe it is well known as occurring in moss, under stones, etc. but lately it has begun to attack gooseberries and has become a serious pest of them. In the United States, on the contrary, it is only recorded from several kinds of fruit trees and clover, but not from moss.

The cephalothoracic plate does not exist in the larva, which gives it a likeness to the larva of *Tetranychus*, from which, however, it is easily separated by the different shape of the hairs of the body, those of *Bryobia* being flat and scale-like; in the first nympha (length 0·34 mm.) the plate is indicated by the lateral pair of the 4 anterior hairs being inserted on small prominences; in the second nympha (length 0·45–0·47 mm.) the plate is better developed, although still much smaller than in the adult. It is, in consequence, easy to distinguish between the different instars with the aid of the shape of the cephalothoracic plate. The hairs of the body are present in the same number and position in all instars—4 pairs on the cephalothorax, 2 of which in the second nympha and in the adult are inserted on the plate and 12 pairs on the abdomen; the hairs of the adult are broader than those of the larva and of the nymphae. Two pairs of eyes exist, contrary to Berlese's and Sorauer's statements; the tarsi are provided with two claws and between these an empodium provided with two dense rows of adhesive hairs; in the adult, however, the first tarsus has much weaker claws and greatly reduced empodium owing to the first pair of legs having developed into tactile organs.

The propagation of the gooseberry mite takes the same course in Sweden as it does in England and Germany; the eggs hibernate on the branches and in the beginning of May the larvae make their appearance, the greatest amount of damage being done in May and the begin-

ning of June ; in the last weeks of June the eggs are laid and the adults disappear.

The damage consists in the mites sucking the sap of the leaves, which results in the appearance of white patches, which become so numerous that often the whole leaf turns white and finally falls off, as do also the berries.

As a remedy, the author suggests the use of lime-sulphur spray against the eggs in early spring.

KURDJUMOV (N. V.). **Главнѣйшія насѣкомыя, вредящія зерновымъ злакамъ въ средней и южной Россіи.** [The more important insects injurious to grain-crops in Middle and South Russia.]—**Труды Полтавской С.-Х. Опытной Станціи. Отдѣлъ сельско-хозяйственной энтомологіи.** [*Studies from the Poltava Agricultural Experiment Station*, No. 17. *Department of Agricultural Entomology*, No. VI.] *Poltava*, 1913, 119 pp., 49 figs., 7 col. plates.

In a short preface to his book the author points out that the absence in the Russian literature of a work devoted to insect pests of grain crops led him to undertake this task. The book deals only with insects injurious to standing crops, the pests of grain in warehouses and stores not being included.

The first chapter of the book consists of synoptical tables of identification of various insects according to the stage of the pests and the parts of plants injured by them ; the tables contain (1) insects and their stages injurious to sown grains and roots of grain ; (2) those injurious to sprouts of young plants ; (3) those injurious to leaves and stems of plants in a more advanced stage of growth ; and (4) insects and their stages injurious to grain in the ear. The author goes on to deal separately with various orders of insects, starting with Orthoptera, and describes the habits of the following ACRIDIIDAE : *Locusta (Pachytylus) migratorius*, L., *L. danica*, L., *Caliptamus italicus*, L., *Oedaleus nigrofasciatus*, de G., and *Stauronotus moroccanus*, Thunb. He then passes to the remedies against them ; ploughing in autumn to destroy the egg-masses, insecticides (which he considers to be the most important remedy against the larvae), poisoned food, hopper-dozers, crushing, burning, and driving into trenches. He further deals in the same way with *Gryllotalpa gryllotalpa*, L., and devotes the third chapter of his book to various species of Thrips. *Limothrips denticornis*, Hal. (*Thrips secalina*, Lind.), a description of which is given, occurs on rye ; it winters in the imago stage on wild grasses, but only the female survives, the male perishing during the summer. The injury done by the larva and imago is described, but the author is unable to suggest any remedies, as the reploughing or burning of the stubble would prove of no use, owing to the absence of the insects from the latter in autumn and winter. *Stenothrips graminum*, Uzel, is usually found in oat fields ; the author suggests as a preventive not to sow early oats, these being also less productive. This species winters as a larva deep in the earth ; therefore ploughing in the stubble would not be effective. *Haplothrips aculeata*, F. (*Thrips frumentarius*, Beling), is often mistaken for *H. tritici*, Kurdjumov ; the insect winters in the imago stage and attacks rye-crops early in

the spring; only the females hibernate. Early in July the first generation migrates to maize, on which a second generation is produced. *Haplothrips tritici*, Kurdj., is the most important and injurious species in these parts of Russia. It winters in the larval stage in the earth or on wheat stubbles, and these larvae do not become mature until about a month after their appearance in the first half of May. The imago flies first on to rye, passing afterwards on to wheat, both winter- and summer-sown, where oviposition takes place. The injuries caused by this pest are very serious, owing to its great numbers; in 1912 it was impossible to find grains of wheat which had not either been injured by the insects or did not contain a larva. As remedies, the burning of the stubbles is recommended, from which good results are expected, judging by the experiments conducted at the Poltava Experimental Station in 1911; the reploughing or scarifying of the stubbles in July is also effective, as after these operations the moisture of the soil is greater, thus favouring the development of the fungus, *Botritis bassiana*, Bals., which attacks these pests.

The author further describes the life-history, the injury done by, and the control measures against the following bugs:—*Eurygaster integriceps*, Osh., *E. maura*, L., and *E. austriaca*, Schr., *Aelia acuminata*, L., and two species of *Miraria*. He goes on to describe various Aphids injurious to grain crops, giving a synoptical table for their identification. The following species are dealt with:—*Macrosiphum granarium*, Kirby (*Siphonophora cerealis*, Kalt.), *Toxoptera graminum*, Rond., *Brachycolus noxius*, Mordw. (*korotneri*, auct.), *Sipha maydis*, Pass., *Aphis padi*, F., *A. avenae*, F., *A. euonymi*, F., *Anoecia corni*, F., *Tetraneura ulmi*, de G., *T. rubra*, Licht., *Pentaphis trivialis*, Pass., *P. marginata*, Koch, *P. setariae*, Pass., and *Paracletus cimiciformis*, Heyd.

In dealing with Lepidoptera the author devotes most of his attention to *Euxoa* (*Agrotis*) *segetum*, Schiff., and next to *Oria* (*Tapinostola*) *musculosa*, Hb. (*frumentalis*, Lind.) and *Trachea* (*Hadena*) *basilinea*, L. *Oria musculosa* is one of the chief pests of grain crops in North Caucasia, in the province of Don and in the Governments of Taurida, Cherson, and Ekaterinoslav. The insects are on the wing during June and July and oviposit on young shoots, also on weeds and stubbles, each female depositing up to about 200 eggs. The eggs remain over the winter, the caterpillars appearing at the end of April and boring into the stems, where they develop. The larvae pupate in the earth during the first half of July, the imago emerging in about a fortnight. The plants most injured by these insects are wheat, both summer-sown and winter-sown, barley and oats; they do not touch maize. The remedies suggested are the burning of the stubbles, the mowing and burning of weeds round the fields, and the reploughing in autumn of the attacked fields to a depth of about 7–8 inches, also the rotation of crops, including the cultivation of such plants as maize, beet and potatoes, which are not injured by the pests. Besides these most injurious moths, the author deals also with *Feltia* (*Agrotis*) *exclamationis*, L., *Euxoa* (*Agrotis*) *tritici*, L., *Hydroecia nictitans*, L., *Phlyctaenodes sticticalis*, L., *Pyrausta* (*Botys*) *nubilalis*, Hb., *Crambus luteolus*, Schiff., *C. jucundellus*, H.S., and *Ochsenheimeria taurella*, Schiff.

The sixth chapter is devoted to Coleoptera, chief amongst which must be placed *Pentodon idiota*, Hbst., *Anisoplia austriaca*, Hbst., *Agriotes lineatus*, L., *Lema melanopa*, L., all of which are very fully discussed. An

account is also given of *Zabrus tenebriodes*, Goeze, *Ophonus* (*Pardileus*) *calceatus*, Duft., *Melolontha melolontha*, L., *M. hippocastani*, F., *Amphimalus solstitialis*, L., *Anisoplia cyathigera*, Scop., *A. segetum*, Hbst., *Tropinota hirtella*, L., *Athous niger*, L., (more common and injurious in the south of Russia than *Agriotes lineatus*), *Opatrum sabulosum*, L., *Pedinus femoralis*, L. (the last two species injure tobacco and maize), *Dorcadion carinatum*, Pall., *Lema cyanella*, L., *Chaetocnema aridula*, Gyll., and *Phyllotreta vittula*, Redt. The larvae of *Chaetocnema aridula*, Gyl., are found in the governments of Poltava, Charkov and Tula, and probably also in many others; they winter in the imago stage and appear in the fields early in spring, ovipositing on the dead parts of plants, close to the earth; the larvae live inside the stems of rye, wheat, barley and oats, but the greatest damage is done to summer wheat and to barley; the second brood appears in the middle of July. Dry weather favours the injurious activities of this pest; as a remedy early ploughing of the stubble is recommended.

The author then proceeds to describe the dipterous insect pests:—*Mayetolia destructor*, Say, to which special attention is paid; *M. avenae*, Marchal, which has not been previously recorded as a pest in Russia; *Lasioptera cerealis*, Lind.; *Contarinia tritici*, Kirby, which is seldom injurious in Russia; *Oscinella frit*, L., with which the author again deals very exhaustively. The last-named insect flies from the beginning of May, the average duration of life in nature being 2–3 months; the number of generations may be three or four during one summer, although the author is of opinion that in the latitude of Poltava there is only one generation. The insects may be found till the middle of October, the greatest damage being done to summer-sown crops, the winter crops being able to recover from their injuries during the long autumn. As to remedies, the author approves of the late sowing of winter crops, deep early ploughing, early scarifying of the stubbles, and strongly recommends the destruction of fallen crops; he points out that every prolongation of the period of growth of summer-sown crops increases the percentage of their infection by this insect, and that those sorts of summer crops which tiller less and come into ear earlier are better able to withstand the attacks of the pests; while winter crops recover by their tillering early in spring and late in autumn, summer crops by the same tillering increase their chances of infection. Other flies mentioned are *Chloropus taeniopus*, Mg., which produces two generations yearly, and sometimes does considerable damage to crops, especially if winter-sown; *Meromyza saltatrix*, L., which is not very injurious; *Hylemyia* (*Leptohylemyia*) *coarctata*, Fall., the damage done by which is specially noticeable in spring on winter wheat and rye; *Hydrellia griseola*, Fall., reported from Crimea, and from so far North as the governments of Moscow and Kurland, injures chiefly late-sown barley; and *Domomyza nigripes*, Zett., which injures mostly leaves of winter wheat, although the damage is not great.

The last chapter of the book contains the descriptions of some Hymenoptera, the most important of which are the sawflies, *Cephus pygmeus*, L., *Astatus niger*, Harr. (*troglodytes*, F.), found in middle Russia on rye, and *Trachelus tabidus*, F., from south Russia. The author describes the habits of and remedies for *C. pygmeus*, and is of opinion that the method of harrowing out and burning of the stubble.

after the land has been scarified, is ineffective; he gives a table summarising the results of some experiments conducted at the Station in Poltava, in 1912, from which it appears that after the harrowing has been thrice repeated only 5½ per cent. of the stubble has been thrown out. As to the burning, the author is of opinion that this remedy can be applied on winter-sown fields, especially when this is done early in July and in dry years. He does not think that an earlier harvest can be considered a remedy, as the insects usually leave the crops much before they can be harvested. The deep ploughing of the stubble seems to be the best remedy, as is shown by some experiments at the Station, which, however, are not quite completed. *Isosoma noxiale*, Portch., in some years attacks up to 80 per cent. of the stems, although the actual damage is less than it appears, as it has been shown by some experiments at the Poltava Station that the loss to the weight of grain in the attacked stem is 10 per cent. and less. This species has only one generation, the larvae remaining over the winter inside the stems, so that the greater part of them is taken home after the harvest; the thrashing of the crops does not usually destroy the insects, unless a straw press is used, and the author recommends using the straw of winter wheat as fuel or as litter during the winter months; where long stubble is left in the fields it should be burned off. *Isosoma vaginicola*, Fitch (*Isosoma hordei*, Harr.), is very injurious in the governments of Cherson and Ekaterinoslav.

The descriptions of most of the pests given in the book are accompanied by figures of their various stages, plants injured by them, etc. A supplement deals with the Tarsonemid mite, *Pediculopsis graminum*, E. Reuter. The work constitutes a most useful book of reference on the subject.

De Castro Sobrinho (A. R.). **A Batata Inglêsa e a sua Cultura.** [The English Potato and its Cultivation.] *Boletim do Minis. da Agric. Indust. e Comm., Serviço de Informações e Divulgação, Rio de Janeiro*, 1913, i, no. 5 (Nov.-Dec. 1912), 1913, pp. 74-83. [Received 16th Jan. 1914.]

In this pamphlet, which deals with the general cultivation of the potato in Brazil, the author says that the following insect pests of the plant are known:—The potato beetle (*Leptinotarsa decemlineata*), which can be kept down by copper sulphate sprays; a hawk-moth (*Acherontia atropos*), the larva of which is one of the worst enemies of the potato and other Solanaceae; "*Noctua solani*, Fab.," the larva of which is known as "*bicho pardo*" and devours the lower parts of the plant; and an aphis, which may be destroyed by dusting with lime or plaster of Paris.

Bondar (G.). **Brocas das Laranjeiras e outras Auranciaceas.** [Borers of orange trees and other Aurantiaceæ.]—*Boletim do Minist. da Agric. Indust. e Comm., Serviço de Informações e Divulgação, Rio de Janeiro*, ii, no. 3, May-July 1913, pp. 81-93, 15 figs.

The author says that the most important citrus borers in Brazil are *Acrocinus accentifer*, *Diploschema rotundicolle* and *Cratosomus reidi*. In addition to these, C. Moreira has met with a Cerambycid, *Rhopalophora collaris*, Germ., and H. von Ihering records *Trachyderes*

succinctus, though these are by no means common. The large Longicorn beetle, *Acrocinus accentifer*, Oliv., is generally distributed in Brazil and the damage done by it is very serious. In three or four years it is capable of completely destroying a citrus plantation; the destruction of the tree is certain, unless immediate preventive measures are taken. The insects lay their eggs in spring and summer, by preference at the base of the trunk, boring holes for the purpose with their mandibles. The larval stage lasts for about a year, and pupation takes place between July and September, the beetles emerging from August to October, and sometimes later. The beetle flies but little, and does not propagate rapidly, and the author thinks that this is the explanation of the fact that sound and bored trees are constantly found close together. The insect is common in the bush and does similar damage to the white cedar (*Cedrela brasiliensis*) and to certain other trees of different families. The best time for killing the borer is in the months of May and June. The lower parts of the trunks of the trees should be carefully examined and the burrows should be opened up; a little bisulphide of carbon is then injected into the hole with a syringe, and the hole immediately stopped with a plug. This process will kill the lava, pupa or perfect insect. Benzine or gasoline will also answer the purpose.

Diploschema rotundicolle, Serv., another Longicorn, attacks orange, mexeriqueiras (*Citrus deliciosa*, R.), and lemon trees. The damage is somewhat different from that done by the previous insect. The eggs are laid from December till April in minute incisions at the extremities of the branches. The larva bores downwards through the larger branches to the trunk, and the burrows never communicate with one another. Sometimes the trunk is riddled through its whole thickness, and the author says he has seen the trunk of a lemon tree which contained 16 such burrows. The length of the burrow may be as much as 7 to 10 feet. The active condition of the larva lasts approximately 8 months. When growth is completed the larva turns and mounts upwards, enlarging a portion of the burrow into a chamber and making an elliptical orifice ½ inch in diameter for the exit of the perfect insect. This orifice can be easily distinguished from the exit holes for frass made during growth, as it is of larger diameter. Below this opening the larva blocks the burrow, forming a chamber 3 to 5 inches in length, in which it is protected from the attack of ants, etc., in the last period of its development. This chamber is made in the spring at the beginning of the second year of larval life. The pupal stage, according to A. Sampaio, occupies 71 days. The author goes into considerable detail as to the manner in which the burrows are formed and their varieties, and gives a number of figures and photographs. Occasionally the larva makes horizontal burrows, which the author explains as a provision against its being crushed by the natural growth of the stem and by the cicatrisation of the wounds made. He says that this insect damages peach trees in a similar manner, and that in the bush it is frequently to be found on a Euphorbiaceous tree (*Croton foribundus*) locally known as "tapichingui." The treatment consists in inspecting the trees in the months of May and June, searching for frass, and, as the larva has not yet descended into the trunk, cutting off the ends of the small branches. It is then easy to destroy any larva which may have descended towards the trunk

or into an important branch. All the lateral holes for the extrusion of frass should be plugged with wax or clay, and then bisulphide of carbon injected, as in the previous case, into the terminal opening of the burrow. A. Sampaio, after careful study of trees throughout the year, but especially from November to May, says that the female lays her eggs on new and tender branches in the axils of the leaves. Hatching takes place in from a few days to a few weeks, and it will be seen that the buds and young leaves begin to wither; this, he says, is sufficient proof of the presence of the pest, and if this fading of the leaves and buds be carefully watched for, the damage can be stopped almost immediately by cutting off the tip of the branch or twig.

Cratosomus reidi, Kirby, is a large weevil, the larva of which causes very serious damage to orange trees and mexeriqueiras (*Citrus deliciosa*, R.). In several orchards in Campinas this beetle is very abundant, and it is quite a common thing to find from 3 to 10 individuals at work on one tree. The author says that so far no mention has been made of this insect in the agricultural literature of Brazil, in spite of its being so widespread and destructive. He gives the following particulars as to its bionomics. The eggs are laid separately in the spring, in ones and twos, in small holes made in the bark of the tree. The trunks are attacked from the base as far as the branches, and holes have also been found on roots projecting above the soil. As soon as hatched the larva begins to bore into the wood, for some time in a horizontal direction. The frass has the appearance of little balls about 1·5 mm. in diameter, consisting largely of the excrement of the larva. During the first period of development, which lasts for about a year, it is not difficult to discover the borer by means of this characteristic frass upon the ground. In the second year the frass blocks up the hole as if with ribbons of wood, giving characteristic evidence of the presence of the borer, of which there is no other external indication. Sometimes the burrow is superficial, following the bark, and sometimes it is at a depth of 1 to 4 inches. The author has found trunks bored through their whole thickness, and there is a specimen in the Instituto Agronomico containing seven parallel bore-holes made by different insects. In the case of mexeriqueiras, it frequently happens that the trunks or branches are bored to such an extent that they are broken off by the wind. Old bore-holes, from which the frass has been removed by ants, may be confounded at first sight with those made by *Diploschema rotundicolle*, but a slight examination will show the difference. The holes made by *Diploschema* are straight and of uniform diameter, and the walls are marked by transverse incisions made by the mandibles. The bore-holes of *Cratosomus* are generally much larger, sinuous, of variable diameter, and the walls are smooth.

The development of the insect requires two years. Pupation takes place during August and September; the perfect insect is produced in September or October, and emerges in October, November or December. The exit opening attracts attention by its extraordinary size. It is not at all uncommon to find holes of 15 to 17 mm. in diameter in the trunks of orange trees. These holes are found at various heights above the ground, but generally from 50 cm. to 1 metre up the trunk. For a long time it was supposed that these holes were made by *Diploschema*, but careful study showed that this was not the case, and it is now possible to distinguish the attack of the two

insects. The exit hole of *Cratosomus* is round and the bore is inclined upwards, whilst that of *Diploschema* is elliptical, 13–14 mm. across and 9–10 mm. vertically. A new hole indicates that the larva has formed its chamber for the pupal stage, which lasts about a year. The total length of the burrow of *Cratosomus* is 60–70 cm., the diameter being 12–20 mm. It is easy to understand that damage of this kind has a very serious effect upon the trees; one borer alone may endanger the life of a tree. The author describes the larva, nymph and perfect insect, and says that the species is peculiar to Brazil. Nothing is at present known of the indigenous plants on which it feeds.

The remedy, the author says, is simple during the first year of boring, when the frass on the earth reveals the presence of the pest. The opening is slightly enlarged with a boring tool, so as to admit the nozzle of a syringe, and 2 or 3 cc. of bisulphide of carbon are injected, the hole being immediately plugged with wax or clay: the best time to do this is either in May or October. Borers in their second year should be treated in September, when the exit hole has not been opened externally. It is possible, by carefully examining the trunks, to find the position of these holes, the bark over them being dry and split and frequently covered with a gummy moisture. All that is necessary is to remove the bark on this spot and introduce a piece of wood of suitable size and drive it tightly into the hole. The perfect insect then remains imprisoned and dies. The best prophylactic in orchards in which this borer makes its appearance is that used against *Acrocinus accentifer*, that is, to smear the trunks with a substance which drives away the insects and prevents them from laying their eggs. The author gives the following formula:—Crude carbolineum, 1 part; quicklime, 10 parts; water, 40 parts. The lime is first dissolved in a little water, the rest is then added and then the carbolineum is well stirred in. The insect does not fly with ease, and once destroyed, the author thinks that very little trouble will be required to preserve an orchard against further attack. The paper is exceedingly well illustrated with diagrams and photographs showing the method of attack peculiar to each of these borers.

IHERING (R. VON). **Em defeza do "Tico-Tico."** [In defence of the "Tico-Tico" (*Brachyspiza capensis*).]—*Chacaras e Quintaes, S. Paulo*, viii, no. 4, Oct. 1913, pp. 47-49, 1 fig.

The author says that this bird, formerly known as *Zonotrichia pileata*, should be protected in Brazil. From experiments made by himself and still in progress, he has found that each bird consumes daily, on an average, 120 insects, either as adults or larvae. He further calculates that in his own garden of about 7 acres, in which a colony of 10 Tico-Ticos have established themselves, these birds eat close upon 5,000 insects and larvae daily.

POSKIN (J.) **Rapport sur les observations effectuées en 1912.** [Report on the observations made in 1912.]—*Ann. Sta. Agronom. de l'Etat. Gembloux, Bruxelles*, ii, 1913, pp. 353-366.

Among cereals, *Tylenchus devastator*, *Oscinis frit* and *Zabrus gibbus* have been reported, but they occur only in isolated areas and do not cause serious damage. Sugar-beet has been severely attacked by

Aphis papaveris in certain localities. *Cassida nebulosa* and *C. oblonga*, pests of the beet, well-known but fortunately rare in Belgium, are capable of causing considerable havoc; arsenical spraying appeared to be effectual against them.

Among Aphids, *Hyalopterus pruni*, *Myzus ribis* and *M. cerasi* have severely attacked various fruit trees. *Aphis mali* was abnormally abundant, causing much damage to apple trees. *Eriosoma* (*Schizoneura*) *lanigerum* also continues to spread. The pest limits itself to the more superficial roots, and on this account winter treatment is preferable. The destruction of the infected roots or the sulphuring of the soil around the trees is far more effective than washing the trunk and branches with soapy water. The British Board of Agriculture recommends strongly the use of calcium carbide, which in the presence of water gives off acetylene. Pieces of the carbide are introduced into holes in the earth around the tree, which should then be closed immediately. If the earth is very damp, in order to prevent too rapid decomposition, the pieces of carbide can be folded in paper. The difficulty of summer treatment is in finding a suitable method of applying the insecticides. M. Ritzema-Bos is of the opinion that no really efficacious method of dealing with this insect exists; after each treatment a few survive and these rapidly increase.

Observations have also been made on forest trees. It has been specially noted that much damage has been wrought among the oaks in Belgium, and it will probably become a question as to whether they should not be excluded from the forests. The pest attacking the oak in the region of Valenciennes is a Buprestid beetle, *Agrilus biguttatus*, F. In the forest of Raismes there was great mortality among the trees. In 1881 Altum noted that this Buprestid was rather common in the district of Eberswalde: it is also mentioned by Judeich and Nitsche and by Nüsslin. Checking the pest is unfortunately difficult, except by destruction of the infested trees. *Agrilus viridis*, so far as is known, is limited to the forest of Raismes.

POSPIELOV (V.) **Свекловичный долгоносикъ и мѣры борьбы съ нимъ.** [*Bothynoderes punctiventris*, Germ., and methods of fighting it.]—An Agricultural Monograph published by **Главное Управленіе Землеустройства и Земледѣлія, Департаментъ Земледѣлія.** [Central Board of Land Administration and Agriculture, Department of Agriculture.] *St. Petersburg*, 1913, 2nd Edition, 116 pp., 8 figs, 3 tables.

Bothynoderes punctiventris, Germ., is one of the most permanent and serious pests of sugar-beet, and is found from Austria-Hungary to Caucasia and the southern part of Siberia (Dauria). Within these areas it is to be found wherever beet is grown, but in some places its development is checked by certain meteorological local conditions, as, for example, in the governments of Kursk, Tambov, Samara and Voronezh, and in Russian Poland; but in the governments of Kiev, Podolia, Charkov and some other parts of south-western Russia its power of multiplication is very considerable. It was in the district of Tchigirin, in the government of Kiev, "the cradle of the Russian sugar-beet industry," that its injurious activity was first noticed in 1851; in the middle of the 'eighties of last century it was first observed

in Hungary, thence spreading to Austria, Moravia and south-eastern Germany. The author gives a list of 25 species of CURCULIONIDAE which he has observed from 1903 to 1905 in beet plantations in Kiev, of which 14 species are recorded for the first time from beet (pp. 12-14). He has not found *Leucosomus pedestris*, Poda (*ophthalmicus*, Rossi) or *Psalidium maxillosum*, F., though these have been reported by other authors; he also gives some information as to the habits of some of these pests.

B. punctiventris winters in the imago stage, the beetles remaining beneath the earth after their emergence from the pupa in the autumn. Only a very small percentage (1-4 per cent.) winter in the pupal stage, and a considerable proportion of these perish during the winter. In spring the insects appear, and the resulting larvae pupate in July, so that there is normally only one generation in the year.

Outside beet-plantations there is very little food for these insects, as their wild food-plants are only *Atriplex* and *Chenopodium*; they do not touch, even when starving in captivity, either *Artemisia*, *Plantago*, vetches, or any other papilionaceous plant; the damage done by them to beet is therefore the more serious, once they get on to a plantation, especially if they arrive there at the moment when the sprouts just appear. In that case they attack the cotyledons and bite through the shoots. When the second pair of leaves appears, the sprouts are better able to withstand the attacks of the insects, which then eat round the leaves, but are not able to gnaw through the whole plant.

The female is able to lay 1-6 eggs daily; the total number of eggs laid by 3 females in captivity was 82, 84 and 110 respectively. The insects apparently prefer friable surfaces for oviposition. As to the duration of the life of the insects, specimens are often found which live three months and more, the male usually living the longer; one male was kept alive for 6 months.

The author further describes very fully the egg, the larva, its moulting stages, the process of moulting, the pronympha and the pupa of *B. punctiventris*. According to his experiments the development of the larva inside the egg lasts 10-11 days, the larval stage occupies somewhat less than two months (48, 49, 51 days) the pronymphal stage about 5 days, and the pupal stage about 13-16 days. The larvae feed on the roots and the direct damage done by them does not appear to be very great, causing the death of the plants only when accompanied by drought; but the effect upon the sugar production is considerable.

The author goes on to deal with the conditions favouring and checking the development of *B. punctiventris*. The weather conditions influence the oviposition and consequently also the number of eggs laid; the development of the larvae also depends on the meteorological conditions, as they require a moderate amount of moisture in the soil; abundant moisture provokes various fungus diseases, while drought causes the larvae to pass deeper into the earth, where they find no food, and dwarfed pupae are produced. Extensive drought also provokes red muscardine (*Sorosporella uvella*, Krass.). The weather conditions influence also the hibernation of the imago, a rainy autumn and a winter with little snow and frequent thaws causing the death of many beetles.

As to the insect enemies of *B. punctiventris*, no parasites are known to exist. The following are amongst the enemies of this insect from the animal world :—(1) ants ; (2) various beetles of the family CARABIDAE : *Poecilus cupreus*, L., *P. punctatus*, Schall., *Pterostichus melas*, Creutz. *Amara apricaria*, Payk., *Ophonus pubescens*, Müll., *O. griseus*, Pz., *O. calceatus*, Duft., and *Harpalus psittaceus*, Fourc., all of which, both in their adult and larval stages, destroy the larvae and pupae of *B. punctiventris* ; (3) another beetle, *Hister fimetarius*, Hbst. ; (4) birds, such as rooks (*Corvus frugilegus*) and some species of bustards. In the stomach of a rook, examined by Terestchenko on the evening of 20th April 1905 (the first warm day when the beetles started leaving their holes), there were found 133 proboscides of *B. punctiventris*, 1 undamaged specimen of *Poecilus cupreus*, 2 specimens of *Hister* sp., and 13 wheat grains ; (5) some parasitic worms of the genus *Mermis* and microscopic ASCARIDAE.

The activity of all these animal enemies of *B. punctiventris* is, however, insufficient to check its multiplication. A more important part is played in the destruction of this pest by various parasitic fungi, which provoke the muscardine disease amongst the larvae, pupae and imagines, from 20 to 80 per cent. perishing from this disease in different years, it being more prevalent in the years in which the weevils are most numerous. The author deals very fully with the various forms of this disease and with the many experiments which have been undertaken in order to infect the pests with it. He describes the "green muscardine," so called by Metchnikov, produced by the fungi *Oospora destructor*, Metchn., *Entomophthora anisopliae*, Metchn., and *Isaria destructor*, Metchn., and the "red muscardine" produced by *Sorosporella uvella* ; both these diseases attack all the stages of the beetle, except the egg. There is also a "white muscardine" provoked by the fungus *Botrytis bassiana*, which, according to Krassiltchik, attacks the imago of *B. punctiventris*, while he was not able to detect it on the larvae or pupae of this insect. Attempts were made at Smiela, by Krassiltchik in 1884 and by Danysz in 1900, to disseminate these diseases artificially, but without success. Toporkov, in discussing these experiments, has suggested that only green muscardine should be used, as the white form does not develop well in the soil of the government of Kiev ; and he further recommended that the infection should be induced by sowing the spores of muscardine in the earth together with the seeds of beetroots, for which purpose the seeds must be covered with a powder of the spores, about 10 lb. of the latter being used for approximately 1¼ cwt. of seeds. However, the experiments undertaken by Toporkov failed, as did also some other experiments at the Station in Smiela. The author urges the necessity of further investigations, in such a direction as to show which micro-organisms and which of their stages are active destroyers of the larvae of *B. punctiventris* ; what are the natural conditions favouring the spread of the disease ; how long the micro-organisms retain their activity ; and how deep they must be buried in the earth. With regard to the first of these questions the author refers to the work of P. Buchner on Symbions ("Studien an intracellularen Symbionten," Arch. f. Protistenkunde, xxvi, 1912) and suggests that probably *Oospora destructor* is a symbion, producing mycelium only in larvae living in unfavourable conditions. The author has also found some diseased

larvae from which he obtained examples of *Bacillus bombycis*, the number of larvae suffering from this disease (flacherie) being considerable in the wet summer of 1903.

Coming to the remedies the author divides them into two groups—mechanical remedies, more or less connected with the methods of soil cultivation, and chemical remedies. In order to destroy the eggs which have been laid in the spaces between the rows, and also the larvae, he suggests hoeing the surface so as to make the soil friable, and gives a table showing the satisfactory results of this method. In order to destroy the wintering specimens autumn ploughing of the fields to a depth of 8–10 inches is recommended, thus exposing the beetles to the weather. The author is also of opinion that the fields ought to be left fallow instead of using them, as is now done, for summer crops; he further recommends the use of mineral manure, and a reduction in the size of the plots so that they can be better protected by surrounding trenches. These trap trenches usually have a width and depth of 14 inches, with smooth walls, that next to the plot having an inclination of 30°; along the bottom of the trench holes about 8–9 inches deep are made at intervals. The beetles that are trapped must be collected daily and destroyed by burning or with boiling water. In order to facilitate the detention of the beetles the use of various sticky substances is recommended; these should be smeared over straw, which is put into the holes in the trenches, and sticky strings may be placed along the channels. The best material is Tree Tanglefoot, but the author gives also a recipe for an adhesive, which he recommended in 1904. About 7 lb. of crude naphtha is heated to the boiling point, after which about 8 lb. of resin is gradually added. This adhesive is most effective at a temperature of 20° R. (77° F.); in the sun at a higher temperature it melts, so that the proportion must be altered to one of 8 lb. of resin to 6 lb. of crude naphtha. This mixture can also be smeared over small boards, which are put into the trench. The use of small tin vessels sunk in the floor of the trench is also recommended, as they require less attention, and when full can be easily emptied and replaced. All these practical matters are dealt with in detail by the author and are accompanied and illustrated by various tables and figures.

An account is then given of sprayers of different kinds which can be used either on special trap zones or over the whole plantation. These zones are useful so long as the insects move on foot, but must be abundantly sprayed with strong insecticides; later on it is necessary to spray the whole of the plantation. Barium chloride and Schweinfurt green are considered to be the best insecticides. The former is more effective during hot weather, which the author attributes to the influence of the sun's rays on the beetles. He describes some of his experiments, which have shown that when exposed to the rays of the sun the beetles perish, even when they have not been previously poisoned. The effect of barium chloride is to produce paralysis of the legs, which prevents the beetles from taking shelter from the sun underneath leaves, where they normally hide during the hot hours. In wet weather the effect of this insecticide is not so great and sometimes it is quite useless. "Djipsin" and Scheele's green are not so effective as the two first-named insecticides, which may also be combined.

GRANDI (G.). **Gli stati postembrionali di un Coleottero** (*Otiorrhynchus cribricollis*, **Gyl.) a riproduzione partenogenetica ciclica irregolare.** [The postembryonal stages of a beetle (*O. cribricollis*, Gyl.) with parthenogenetic reproduction at irregular intervals.]—*Boll. Lab. Zool. gen. agrar., Portici*, vii, 24th Sept. 1913, pp. 72-90, 12 figs.

Of the weevils of the genus *Otiorrhynchus*, Germ., three species are already known to reproduce parthenogenetically at irregular intervals; *O. turca*, Boh., *O. ligustici*, L., and *O. cribricollis*, Gyl. The author gives a full description of the last-named species in all stages. The eggs are laid at night in the second half of September and early in October. The females seem to prefer dewy nights, when they climb up the stems of the lucerne, on which they feed, and drop their eggs on to the ground. In the laboratory the eggs hatched out in 14 to 24 days, and the larvae almost immediately disappeared into the soil. The adults begin to die in October and none are to be found by November. The author could not ascertain if any hibernate. The larvae have considerably increased in size by the end of November, and are then at a depth of 4 to 6 inches, feeding on the tender rootlets of the lucerne. The larval stage lasts about 6 months, till the following May; the pupal stage lasts from 10 to 15 days and the imago appears about the middle of June. It is then often the prey of an Ascarid, which is at present being studied. During July, August, and September the immature adults remain hidden by day a couple of inches beneath the surface, whence they issue at night to feed. Although the damage done by larvae and adults to the lucerne plantations at Portici are by no means negligible, yet it is not such as to cause alarm.

GRANDI (G.). **Descrizione della larva e della pupa della** *Sitona humeralis*, **Steph., ed osservazioni sulla morphologia dell'adulto della medesima specie.** [Description of the larva and pupa of *Sitones humeralis*, Steph., and remarks on the morphology of the adult of the same species.]—*Bull. Lab. Zool. gen. agrar., Portici*, vii, 6th Oct. 1913, pp. 93-100, 7 figs.

The larva of *Sitones humeralis*, Steph., feeds on the roots of various species of lucerne: *M. sativa*, L., *M. lupulina*, L., *M. minima*, Gruf. In view of the slight differences existing between the larva of *S. humeralis* and, for instance, that of *Otiorrhynchus cribricollis*, Gyl., the author believes that the distinctive characteristics of the larval stage of the various species of *Sitones* will not be markedly different. A very fully detailed description is given of *S. humeralis*, the full-grown larvae of which were found at Portici early in May. About the middle of the same month nearly all had transformed into pupae. The pupal stage lasts from 10 to 14 days. In captivity the imago appeared in the first week of June.

PALMER (E. F.). **Box-Packing of Apples.**—*Ontario Dept. Agric. Toronto, Ont., Bull.* no. 216, Oct. 1913, 24 pp., 13 figs.

This bulletin gives a detailed account of the best methods of packing apples in boxes. Regarding the wiping of apples there has been some discussion. The advent of the codling moth has made spraying imperative and it is this spray that is objectionable. An apple after being

wiped presents a better appearance to the average buyer. Wiping is easily done immediately after the fruit is picked. The apple should not be rubbed hard, the object being simply to remove the dust and spray, of which many people are afraid because of its poisonous nature, though it has been proved that it would take the spray from 600 apples to make a minimum dose of poison dangerous to a human being. A pair of cheap cotton gloves is superior to a rag for wiping.

REUTLINGER (—). **Eine erfolgreiche Bekämpfung des Heu- und Sauerwurms.** [A successful method of combating the vine-moth.]—*Weinbau der, Rheinpfalz, Neustadt a. Hdt.*, i, no. 24, 15th Dec. 1913. pp. 308-311.

In an isolated vineyard of about 6 acres the author has succeeded in stamping out the vine-moth. The measures against the pupae were applied in 1910, 1911 and 1912. The grubs were combated in 1911, and also in 1912, though not so extensively. As a result only 11 moths were observed in 1913, and *Peronospora* and *Oidium* being also absent, perfectly healthy grapes were obtained. Nevertheless the methods employed against the pupae—brushing the stocks, earthing them up, and careful burning of all débris—were carried out in 1913, and the author lays very great stress on their conscientious execution. In dealing with the grubs the following formula was used: (*a*) 2 gals. water, 1 lb. soft soap, 1 lb. fusel oil, 1½ oz. raw nicotin (98 per cent.); or the alternative formula: (*b*) 2 gals. water, 1 lb. soft soap, 1 lb. methylated spirit, 1 lb. duty free tobacco-extract. The cost for these quantities was: soft soap 2½*d.*, fusel oil 1*s.* 6*d.*, raw nicotin (98 per cent.) 1*s.* 6d., methylated spirit 2¼*d.*, duty free tobacco extract 1*s.* 1*d.* The solution was squirted into suspicious places with sewing-machine oilers, with the nozzles of which any webs present were removed before injecting the insecticide. The work was performed by children, who are found to be by far the best suited for it. Walls, tree-trunks, etc., were searched and treated. Taking a working day of 8 hours, the wages of a man at 3*s.*, those of a girl at 1*s.*; the costs for labour during the 19th, 22nd, and 28th June 1911, worked out at 17*s.*, 17*s.*, and 16*s.* respectively. One man was employed on all 3 days, 14 girls on the first two, and 13 girls on the third; 20 gals. of emulsion (*a*) were used at a cost of 32*s.* The total expense for the 6 acres was £4 2*s.* (or £3 5*s.* if emulsion (*b*) is used). To this the cost of 20 oilers (5 kept as a reserve) must be added, 6*s.* In view of the poisonous nature of the insecticides, the workers were not allowed to take any food with them to the vineyard. The author states that wages have increased since 1911, and says that although he has practised bird protection for the past 20 years, the birds appear to do more harm than good.

VIERECK (H. L.). **Type Species of the Genera of Ichneumon Flies.**—*U.S. Nat. Mus., Washington, D.C., Bull.* no. 83, 1914, 186 pp.

This bulletin consists of an alphabetic catalogue of the genera of the Ichneumonoidea together with the type of each genus, and references to descriptions of the genera. An index to the genotypes has been added.

BRITTON (W. E.). **Thirteenth Report of the State Entomologist.**—*Report of the Connecticut Expt. Stn. for* 1913, *New Haven*, 1914, pp. 181, 3 pls.

During the year 1913 there was an unusual abundance of the apple-tree tent-caterpillar, *Malacosoma* (*Clisiocampa*) *americana*, F., its presence being reported from very many towns. Specimens of the forest tent-caterpillar, *M. disstria* were received from Wallingford and Salisbury. The result of this abundance of tent-caterpillars led to the preparation of a new publication which appeared in August as Bulletin 177 [see this *Review*, ser. A, i, pp. 381-382], and gave a full account of the insects. Many cocoons were collected and nearly one-half of them were found to be parasitised by Ichneumons and Tachinid flies. A large proportion of the Ichneumons belonged to the genus *Pimpla*, *P. conquisitor*, Say, being one of the commonest species.

During 1912 white grubs were extremely abundant in Connecticut and similar damage was feared for 1913. Few complaints of white grub injury were, however, received; neither were the adult beetles so abundant as expected. The species were identified as *Lachnosterna fraterna*, Harr., and *L. fusca*, Froehl.

Serious damage to yews, *Taxus cuspidata* var. *brevifolia*, was reported from a nursery at Pomfret. From material forwarded to the laboratory the species was recognised as *Otiorrhynchus sulcatus*, F. This weevil devoured the small roots of the plants and attacked both the larger ones and the main stem below the surface of the ground. A similar injury to the roots of young hemlocks was recorded as caused by *O. ovatus*, L. Both *O. ovatus* and *sulcatus* are European species and the latter is recorded as injuring *Taxus* and Rhododendron plants in Europe. *O. sulcatus* has also been recorded as injuring grape vines, cyclamens and ferns, and as occasionally attacking garden vegetables. It is suggested that possibly carbon bisulphide injected into the ground around the plants in late summer might kill the larvae before they had seriously injured the plants. It has also been reported that in south-western Connecticut and in adjoining portions of New York State during the past two or three years many hickory trees have died and many more have been injured. The chief cause of this seems to be a small beetle, *Scolytus quadrispinosus*, Say. During July and August the beetles tunnel in the new growth at the axils of the compound leaves, causing them to break off. Later the parent beetles make their brood galleries just under the bark. When there are many galleries in the main trunk of a tree the effect is the same as girdling and the tree soon dies. Badly infested trees cannot recover and should be removed. Dr. Hopkins recommends that all infested trees be disposed of between 1st October and 1st May, so as to kill the over-wintering beetles. This can be done by peeling or by using the wood as fuel. If the outer portion be allowed to remain on the logs during the following summer the beetles will escape and may attack other trees. If a tree is not infested it may be worth while to spray the bark on the trunk and branches with lead arsenate, 1 lb. in 5 gals. of water. Thoroughly spraying the foliage with the same mixture after about 1st July may prevent damage to the leaf stems.

Infested fruit from Cannon Station, Mystic and Watertown contained the larvae of the pear midge, *Contarina* (*Diplosis*) *pirivora*,

Riley. This insect is distributed throughout the north-eastern United States and in Central Europe. The adult is a small two-winged fly which lays its eggs in the clusters at blossoming time or even earlier. Dr. Felt has found the larvae at the base of the calyx at the time the petals fall and they soon work their way into the young fruit. The infested pears usually crack open after rain and thus allow the maggots to escape. These maggots go into the ground to pupate and the adults emerge the following spring. Certain varieties as Bosc, Bartlett and Seckel seem to be injured more than others. The species has been gradually eradicated in New Jersey, but maintains itself in a few places near Newark and New Brunswick. No remedial treatment is known other than gathering and destroying the infested pears before the maggots leave them. The injured fruit may be distinguished by their deformed appearance. Cultivating the soil during the month of June would doubtless destroy many larvae in the ground.

In Greenwich, Conn., the West Indian Peach Scale, *Aulacaspis pentagona*, Targ., was discovered on Chinese privet, *Ligustrumibota*. It had not previously been recorded from Connecticut. It infests a great variety of plants belonging to widely different botanical families, and has a wide distribution. Dr. H. T. Fernald states that it has been found abundantly on flowering cherry imported into Massachusetts, and it is believed that this insect was present on weeping cherry imported from Japan three years ago into a Connecticut nursery. These trees were fumigated with hydrocyanic acid gas and when examined were clean. The low temperatures experienced during the winter in the States will probably prevent this scale from becoming a destructive pest. When not covered by the bark of the host plant the scales are white and conspicuous like the rose scale, *A. rosae*, Bouché. If the scale withstands the winters and infests and injures trees and shrubs it is probable that a thorough spraying with a good contact insecticide, like the lime-sulphur wash or one of the oil mixtures, will serve to hold it in check.

BRITTON (W. E.). **Insect Notes.**—*Rept. Connecticut Agric. Expt. Sta. for* 1913, *New Haven*, 1914, pp. 250-256. 2 pls.

As a result of an examination of unhealthy and dying oak trees at Greenwich the trouble was found to be due probably, not primarily to insects, but to injury from cold and drought, followed by attacks of borers. The spruce bud moth (*Tortrix fumiferana*, Clem.) was very abundant in 1913 and swarms appeared suddenly on 31st July. The parsley stalk weevil (*Listronotus latiusculus*), not previously reported from Connecticut, was found at a farm in New Haven, and *Pulvinaria vitis*, L., which has seldom been injurious in Connecticut, has badly infested some silver maples at Sound Beach, Stamford. *Omphalocera dentosa*, Grote, has apparently been more abundant and done more damage in 1913 than in any preceding year since observations began. It is noted that the egg-clusters of the tussock moth (*Hemerocampa definita*, Pack.) are often mistaken for those of the gipsy moth, but the whole cluster is more loosely constructed and the eggs more exposed in the former. As a rule also the eggs of *Hemerocampa* are deposited on a network of silk, on or near the old cocoon. Gipsy moth eggs are

usually laid on a solid surface, except in the case of great abundance. The San José scale, which for fifteen years has been a serious enemy of fruit trees, seems to be now on the wane, probably owing to the work of parasites and to spraying. The poplar sawfly, *Trichiocampus viminalis*, Fallén, has been common on Carolina poplars. There are two broods of larvae each year, the first appearing in June. These larvae feed upon the leaves and may be poisoned by spraying the tree with lead arsenate. The larvae of the Longicorn beetle, *Saperda vestita*, were rather common in young linden trees in one nursery this year. They tunnel under the bark and in the wood at the base. Where this borer causes damage, the only remedy is to examine the trees in May and September and to dig out the larvae or kill them in the burrows with a wire, or by injecting a few drops of carbon bisulphide and closing the opening.

Lygus pratensis, L., was unusually abundant in 1913, and injured many plants by sucking the sap from the bud or leaf stem. Several complaints were received regarding injury to dahlia buds, and in Litchfield, potatoes were damaged by this bug.

Britton (W. E.) & Walden (B. H.). **Inspection of Imported Nursery Stock and of Apiaries.**—*Rept. Connecticut Agric. Expt. Stn. for* 1913. *New Haven*, 1914, pp. 191-198.

A Federal quarantine and inspection law came into operation on 1st October 1912, which provided for a system of notices and permits covering all imported field-grown, woody stock entering the United States from other countries, and its enforcement is vested in a board designated as the Federal Horticulture Board. When the Federal law became operative the inspectors received notices as for all other stock and the consignee was requested to send notice to the inspector immediately on arrival of each shipment. Return post-cards were furnished. In some cases the consignee complied with the request, but in many instances the stock was unpacked and distributed without sending such notice, or the notice was sent and the inspector found that the stock had been unpacked and mixed with other stock. It became necessary therefore to obtain thorough and proper measures for inspection. The matter was placed before the legislature and Section 4388 of the General Statutes was amended as follows:—

"All nursery stock shipped into this State shall bear on each package a certificate that the contents of said package have been inspected by a State or Government Officer and that said contents appear free from all dangerous insects and diseases. If nursery stock is brought into this State without such a certificate, the express, freight, or other transportation company or person shall, before delivering shipment to consignee, notify the State Entomologist of the facts, giving name and address of consignee, origin of shipment, and approximate number of cars, boxes, or packages, and probable date of delivery to the consignee. The State Entomologist may cause the inspection and, if infested, the treatment of the stock. No person, firm, or corporation shall unpack any woody, field-grown nursery or florists' stock brought into this State from foreign countries, except in the presence of an inspector, unless given permission to do so by the said State Entomologist or one of his deputies. If such stock is found infested with

any dangerous pests the State Entomologist may at his discretion order it to be treated. Any person violating any of the provisions of this act shall be fined not more than fifty dollars. (Amendment approved 5th June 1913.)"

During the year just closed 1,316 boxes and packages of imported nursery stock have been inspected. This stock was contained in 246 separate shipments, and in seven of these insect and plant diseases were found. The insects reported are: *Lachnus*: An Aphid, sp., on conifers from France; a specimen of the Chrysomelid beetle *Agelastica* (*Galeruca*) *alni*, L., on a box of ornamental stock and on English Ivy (*Hedera helix*); the oyster-shell scale (*Lepidosaphes ulmi*, L.) and an aphis on maple, the last two shipments coming from Holland; an egg of the Chinese mantid, *Tenodera sinensis*, Sauss., on umbrella pine from Japan; two specimens of mealy bug on conifers from Belgium; specimens of a soft scale, *Coccus hesperidum*, L., and of the fig scale on bay trees (*Laurus nobilis*), also from Belgium; a single Noctuid pupa on a plant of Box (*Buxus*) from Holland, the adult emerging from this pupa being identified as *Mamestra dissimilis*, K.; and *Aleurodes* on a number of shipments of Azaleas from Belgium.

As a result of the autumn meeting of the Connecticut Beekeepers' Association in 1912, where it was voted to ask for a larger appropriation for inspecting apiaries and to amend the law to make the work more effective, a bill was introduced into the General Assembly, and an Act finally passed, as an "Act concerning the suppression of Contagious Diseases among Bees Chapter 141 of Public Acts of 1913." This Act repealed Chapter 185 of the Public Acts of 1909 and makes it the duty of the State Entomologist to examine apiaries, to quarantine such as are diseased, and to treat or destroy cases of the disease known as foul-brood. The Act also requires that all shipments and transportations from without the State shall be examined, and in case contagious diseases are found such shipments shall be returned to the consignor or delivered to a duly authorised inspector for treatment or destruction. The statistics of apiary inspection in 1913 and a summary of the inspections for the past four years are shown in tables. With the increased appropriation and authority to inspect without complaint granted by the above Act, which became operative on 1st October 1913, a much larger number of apiaries will be examined next season.

BRITTON (W. E.) & CAFFREY (D. J.). **The Control of the Gipsy and Brown-Tail Moths in Connecticut in 1913.**—*Rept. Connecticut Agric. Expt. Stn. for* 1913, *New Haven*, 1914, pp. 198-223, 2 pls.

The gipsy moth has been all but exterminated in the only two areas known to be infested in Connecticut, Wallingford and Stonington. As a result of scouting for egg-masses at Wallingford, Stonington and other parts of the State, including the vicinity of New London and the town of Thompson, only two egg-masses were discovered at Wallingford, one on the foundation of a house and the other on a fence near this house. Precautions were also taken against the caterpillars and searches made for them, but during the summer of 1913 only three were taken at Wallingford. Scouting was also continued in Stonington, and as a result five caterpillars, one cocoon and

one female moth, which was depositing eggs, were found where no caterpillars had been found since 1910 and no egg-masses since 1911, though the trees have been banded each year. The presence of the caterpillars is not yet understood, unless it be a reinfestation. Tables are given showing the reduction of this pest at Wallingford and Stonington, according to which there were destroyed at Wallingford in 1910, 8,234 egg-masses, 8,936 caterpillars and 96 cocoons, numbers which in 1913 were reduced to 2 egg-masses, 3 caterpillars and no cocoons. At Stonington reduction of the pest is also recorded. In 1906, 73 egg-masses, 10,000 caterpillars and 47 cocoons were destroyed; in 1911, only 3 egg-masses were found; and in 1912, nothing at all; in 1913 there was an increase, 5 caterpillars and one cocoon being discovered.

The result of control measures against the brown-tail moth in Connecticut during the past winter indicates that the area known to be infested has been greatly increased since last year and now includes over 27 towns. In this paper the towns are given with the details and results of scouting. The number of nests have slightly increased in some of the towns and others are infested only to a slight degree. In addition, large infestations were found at Hartford and Suffield. In this work open country was carefully examined and particular attention given to the fruit trees in orchards, around dwelling-houses and along the highways. The brown-tail moth also attacks oak trees in the woodlands, but on account of the leaves hanging on these trees it is almost impossible to detect the nests, and moreover many of them are very far from the ground and it would be very expensive to reach them. For these reasons it is impracticable to scout the entire State and destroy the nests. A table shows the number of nests found and destroyed in each town in 1913 and during the last three years in Windham County. In most there is a marked increase in number from 1912 to 1913.

On account of the presence of the brown-tail moth in Connecticut and the danger of spreading this insect by shipping nursery stock, a quarantine was established by the Federal Horticultural Board, becoming effective on and after 25th November 1912. Later on the quarantine was extended to take effect on 1st August 1913 to include all the present infested area. Nursery stock within this area could not be shipped outside of it unless inspected at the time of packing and duly certified by a Federal inspector. The infested towns, as well as the quarantined area, are shown by a map. The Federal authorities, in co-operation with the State of Massachusetts, have imported into the country all the parasites known to attack both the gipsy and brown-tail moths in the various European and Asiatic countries where these moths occur. The control of this pest by its natural enemies is one of the most promising methods. One of the most effective of the introduced parasites is an Ichneumonid, *Apanteles lacteicolor*, Vier., which attacks the hibernating caterpillars. A Tachinid, *Compsilura concinnata*, Mg., parasitises both the gipsy and brown-tail caterpillars and seems to be well established and spreading freely in Massachusetts. The planting of these along the boundary of the infestation will doubtless reduce the numbers of brown-tail moths and thus check their spread southward and westward. *Apanteles* also attacks caterpillars of the genera *Datana*

and *Hyphantria* (fall web-worm), and *Compsilura* has been reared from the tussock moth, the fall web-worm and the imported cabbage worm.

WALDEN (B. H.). **A Lepidopterous Leaf-Folder on Privet.**—*Rep. Connecticut Agric. Expt. Sta. for* 1913, *New Haven*, 1914, pp. 223-226, 2 pls.

Many privet hedges in New Haven were attacked during May 1913 by larvae which tied together the terminal leaves, forming an enclosure within which they fed. The adult was a Tortricid moth and determined by Mr. W. D. Kearfott as *Archips rosana*, L. This species was introduced from Europe, where it has been observed feeding on apple, elm, willow, birch, wild rose, raspberry, hazel, linden, aspen, hawthorn, currant and gooseberry. The eggs are laid on the twigs in small flattened, oval masses, covered with a dull waxy substance, the masses laid in the breeding cages containing from 24 to 81 eggs. The eggs hatch from about the 1st to the middle of May. The larva feeds on the tip of the growth where it draws two or more leaves together with silk, thus forming an enclosure within which a single larva feeds and later pupates. The first pupae were found in the breeding cages on 3rd June and the first adults on 10th June. There is one brood each year and the winter is passed in the egg stage. Many larvae had eggs of Tachinid flies deposited on the head and first segment of the body, and the flies began to emerge from larvae collected on 18th June. The species was determined as *Exorista pyste*, Walk. Trimming the hedges will remove most of the infested tips which should be gathered and destroyed to kill the larvae. Some of the larvae will let themselves down to the ground when disturbed and later return to the plants. The hedges should be examined after a few days and any infested tips should be removed. Should this insect become troublesome on currants and gooseberries, it may be controlled by a thorough spraying with lead arsenate at the rate of 2 lb. in 50 gals. of water, soon after the leaves unfold.

BRITTON (W. E.), & WALDEN (B. H.). **Field Tests in Controlling Certain Insects attacking Vegetable Crops.**—*Rept. Connecticut Agric. Expt. Sta.* 1913, *New Haven*, 1914, pp. 232-237, 2 pls.

An account of an experiment to test a control for the cabbage fly, *Pegomyia brassicae*, Bouché, is given. Varieties of plants were arranged in order and an area selected for special treatment, namely for the application of tar paper disks. The disks were cut in the form of hexagons, four inches in diameter, from single ply tar paper, and were placed on the stems of plants at the time of setting. Some plants were then "damping off" and failed to recover: others were killed by the cabbage maggot. Of the plants which remained 12 per cent. of the untreated ones and 0·05 per cent. of the disked ones were maggoty.

As a control for the cabbage aphis, *Aphis brassicae*, L., "Black Leaf 40" at the rate of one teaspoonful to a gallon of water, with soap added as a spreader, proved effective and all the aphids were killed. In the tests for a control for the onion thrips, "Black Leaf 40," 1 part to 768 parts of water, and soft-soap; "Black Leaf 40," 1 part to 950 parts of water, and soft-soap; "Scalecide," 1 part to 50 parts of

water, and lime-sulphur, 1½ parts to 50 parts of water, with paste spreader, were tried. None of these was successful. The Scalecide did not coat the onions so well as the "Black Leaf 40" and injured the plants: nor did the lime-sulphur coat the onions satisfactorily.

As a result of testing for a control for the pea aphis, *Macrosiphum pisi*, Kalt., it was found that spray mixtures do not stick readily to the smooth leaf-surface of peas, but gather in drops and roll off. A small amount of common soap dissolved and added to the mixture will usually cause it to spread readily and stick to the foliage. Flour paste did not prove so good a spreader as the soap. Treatments were made in a pea-field and the field was examined after two days. By treatment with "Black Leaf 40" (two teaspoonfuls in one gallon of water, with paste spreader) all aphids hit by the spray were killed, but many live aphids were found on portions of the plants not coated with the spray. The material did not spread so well as where the soap was used. "Black Leaf 40," two teaspoonfuls in one gallon of water, with soap at the rate of 4 pounds to 100 gallons, spread well and very few live aphids could be found. "Black Leaf 40," one teaspoonful to one gallon of water, was just as efficient as where twice the amount of "Black Leaf 40" was used. These sprays did not injure the foliage. Scalecide, one part to fifty parts of water, caused considerable injury to the foliage. There were two varieties of peas in the field, Thomas Laxton and Sutton's Excelsior. No aphids were observed on the former, while the latter was generally infested. If the aphids had been observed at the time they first appeared, when the vines were smaller, the spray could have been applied more thoroughly with much less material. The injury to the vines in driving through the field would also have been much less. The tests with "Black Leaf 40" were quite satisfactory.

Report for the Year ending July 1913 on the Trade of Smyrna.—*Diplomatic and Consular Repts., Turkey; Annual Series*, no. 5247, *London*, Jan. 1914.

Reporting upon agriculture in Adalia for the year ending July 1913, Mr. Vice-Consul G. A. Keun mentions the fact that *Icerya purchasi*, Mask., which has greatly damaged groves of mandarin oranges and lemon trees, was considerably checked during the year, not as in the previous year by cold weather, but through the agency of a ladybird, *Novius cardinalis*, which feeds exclusively on *Icerya*. *Novius* was introduced into Adalia from Scio, where *I. purchasi* was also destroying the groves. The *Icerya* pest is now quickly disappearing, being gradually but surely eradicated by *Novius*, which spreads with great rapidity.

Marlatt (C. L.), **The Alligator Pear Weevil.**—*Entom. News, Philadelphia*, xxv, no. 1 Jan. 1914, p.37.

On page 416, Entomological News, xxv, No. 9 [see this *Review*, ii, Ser. A, p. 13], Hawaii and Porto Rico are incorrectly cited as localities in which the avocado weevil (*Heilipus lauri*, Boh.) is known to occur. The only records of this weevil that are known to the author outside Mexico are Central American. Naturally, no quarantine action will

be taken, or is intended, against the islands referred to, or other avocado-producing countries free from this weevil.

FERNALD (H. T.). **Parasites of the San José Scale.**—*Entom. News, Philadelphia*, xxv, no. 1, Jan. 1914, p. 39.

The author states that the parasite reported as doing such effective work against the San José scale in Pennsylvania was discovered at Amherst, Mass., in the autumn of 1912 in great abundance. Specimens were sent to Dr. L. O. Howard, who declared it to be a new species of *Prospaltella*. During the present autumn, colonies of this insect have been sent to Washington and Georgia in the hope of establishing it there. A shipment of the Pennsylvania parasite has made direct comparison possible and there can be no doubt that they are the same species. This insect was described under the name of *P. perniciosi* by Mr. D. G. Tower and the description published in March 1913.

BLODGETT (F. M.). **Experiments in the Dusting and Spraying of Apples.**—*Cornell Univ. Agric. Expt. Sta., Ithaca, New York*, Bull. no. 340, Jan. 1914, pp. 149-179, 1 fig., 1 pl.

In this Bulletin are given detailed accounts of experiments on the dusting and spraying of apples, to determine the effectiveness of a dust mixture containing 20 per cent. of dry powdered arsenate of lead and 80 per cent. of finely divided sulphur, and of a paste containing the same materials with a small quantity of a colloidal substance to keep the lead and sulphur in suspension, to be applied with water as a carrier, as compared with the standard lime-sulphur solution with arsenate of lead and with an unsprayed check. The insects causing most injury to the apples in 1913 were those classed under "Bud moth and other spring caterpillars"; these include leaf-rollers, green fruit worms, etc. From the tables given it is seen that the best control of each of these insects was secured on the dusted plants, with the possible exception of those in which codling moth larvae entered the calyx; there was practically no difference in the insect control between arsenate of lead applied with lime-sulphur and that applied with suspended sulphur, the latter, perhaps, proving more effective for bud moth and other spring caterpillars and for codling moth and Curculio.

KANEHIRA (—). **On some Timbers which resist the Attack of Termites.**—*Indian Forester, Allahabad*, xl, no. 1, Jan. 1914, pp. 23-42.

The author, writing from Formosa, states that termites, or white ants, are amongst the most destructive insects in that island, attacking field crops, buildings and trees. Few dwellings are free from these insects, since in Formosa the houses are mostly made of wood, owing to the expense of other building material. Among the termites attacking buildings are *Coptotermes formosanus*, Shiraki, *Leucotermes flaviceps* and *Termes formosanus*, the method of attack being different in each species. Experiments were made on the power of resistance of Formosan trees against the attack of termites. Pieces of 59 dried timbers and 41 undried timbers were used, each piece, 1′ 5″ long and 1½″ square, being buried perpendicularly with three inches above

ground exposed. Details of the experiments, dates of inspections, etc., are given in tables. As a result of this work, the characters which make timber termite-proof are stated to be :— (*a*) the presence in the wood of some substance which has a strong smell or taste which the insects do not like; (*b*) the presence of some substance which is poisonous to the insects; and (*c*) the extreme hardness of the wood, rendering it too hard to attack; examples of each character being given.

In a note by the Forest Zoologist, Dehra Dun, on Mr. Kanehira's contribution, attention is called to the fact that the durable timbers, while possessing a relative immunity from white ant attack, are, under certain conditions, readily eaten by the destructive species, no absolutely immune species of untreated timber having been discovered by experiment, so far as is known. Definite indications of absolute immunity can only be obtained by actual infection with the termites, since it does not necessarily follow that the buried wood will be attacked.

RUTHERFORD (A.). **Insects on Rubber in 1913.**—*Trop. Agric., Peradeniya*, xlii, no. 1, Jan. 1914, pp. 41-44.

Hevea brasiliensis (Para Rubber). In August a Cerambycid beetle (*Moechotypa verrucicollis*, Gahan) was sent in from the Kandy District, where it was attacking rubber stumps, chiefly withered ones. Experiments lead the author to conclude that while this beetle is able to eat the bark with impunity in spite of the flow of latex, it prefers dry twigs. There are records of it on Hevea from Matale and Ukuwela, the last report dating from 1907. The trees attacked should be sprayed with lead arsenate. *Saissetia nigra*, Nietner, the black scale, occurs widely on Hevea in Ceylon. It feeds on the leaves and twigs and is frequently attended by the large red ant, *Oecophylla smaragdina*, which often draws the leaves together to form a shelter over the scales. *S. nigra* is a serious pest of cotton in the West Indies, and in Ceylon occurs in injurious numbers on cotton and *Croton tiglium*. That scale-insects are able to subsist on trees containing latex is proved by the fact that *Coccus viridis*, Green, occurs on the leaves of *Funtumia elastica*, *Plumeria* sp., *Landolphia kirkii* and *Alstonia scholaris*; as well as by the fact that *S. nigra* itself flourishes on *Hevea brasiliensis* and *Manihot glaziovii*. *S. nigra* in Ceylon is not so subject to the attacks of hymenopterous parasites as are some allied scale-insects, though the author has reared several specimens of what is very probably *Scutellista cyanea* from the scales on *Croton tiglium*, and has observed that the eggs are subject to the depredations of a Cecidomyid larva. The author thinks no chances should be taken with *S. nigra* and destruction should be effected whenever an opportunity presents itself. The ant is often a nuisance on tea and fruit trees in many parts of Ceylon, and the nests should be broken up and sprayed with kerosene emulsion. Phorid flies were found to have laid their eggs on decomposing smoke-cured rubber, and the maggots were feeding on the products of decomposition. Probably the rubber had been insufficiently dried, as it had developed a mould. The adult flies are small and active and generally lay their eggs in decomposing organic matter.

Funtumia elastica. The caterpillars of the Pyralid moth, *Caprinia conchylalis*, Guen., were found feeding on the leaves of *F. elastica* near

Peradeniya on the 10th October. By the 6th November the trees were heavily infested and had a withered appearance due to the dead leaves. A month later only a few withered leaves remained on the tree, and neighbouring trees of Funtumia, that had up till then remained almost free from attack, were beginning to show here and there a withered leaf. This afforded an object lesson of the consequence of neglecting the first stages of an attack. Had a thorough spraying with lead arsenate, at a strength of 5 lb. to 100 gals. water, been undertaken, the outbreak would probably have been arrested. Hampson gives the distribution as Sikkim, Assam, Bombay, Nilgiris, Ceylon and Burma. Green records the larva as feeding on *Portlandia grandiflora* and *Holarrhena mitis*. Neighbouring trees of Funtumia were infested with *Coccus viridis*, and the leaves were covered with sooty mould. An undetermined Pyralid larva was feeding on the scales, and they were also attacked by a greyish black fungus. *Pulvinaria* sp. was also present on the leaves, and also not a few specimens of *Lecanium caudatum*, Gr.

Manihot glaziovii (Ceara Rubber). Beetles were found boring in several trees that had had their bark skinned during the wet weather in preparation for tapping. One is probably a species of *Xyleborus*, while the other is a long-snouted, slender, dark-brown weevil about 4·5 millimetres long. *Saissetia nigra* has been observed on the leaves of *M. glaziovii*.

Landolphia kirkii (African Rubber). A plant of this species in the Botanic Gardens was found infested with *Coccus viridis*, Gr., the leaves being black with sooty mould, and also heavily infested on their under surface with *Ichnaspis longirostris*, Sign.

BARRETT (O. W.). **Cacao Culture.**—*Philippine Agric. Review, Manila*, vii, no 1, Jan. 1914, pp. 5-15, 4 figs.

At the end of this paper on cacao culture, the author notes that a severe pest of this plant in probably all provinces of the Philippines is the branch-boring beetle [species not stated.] The grub of this insect bores up or down through the centre of the branch causing very severe weakening and final death of the affected portion. Branches suspected of containing these grubs, i.e., those having one or more holes in the bark and showing a weakened condition of the foliage, should be removed and burned. On young plants, scale-insects, aphis, and leaf-eating beetles sometimes do a slight amount of damage but can be easily controlled.

MUNRO (J. W.). **The Variegated Willow Weevil** (*Cryptorhynchus lapathi*, **L.**).—*Gardeners' Chronicle, London*, lv, no. 1411, 10th Jan. 1914, p. 27, 2 figs.

This weevil has recently been reported from the North of Scotland where it appears to be more widely distributed than has hitherto been supposed. It is chiefly an enemy of the willow, although it also attacks alder, birch and poplar. Both adult and larva are injurious: the adult gnaws the tender bark of the young shoots, causing them to wilt and die off; the larva eats into the bark of the stem and main branches, almost girdling them, and then bores into the wood itself.

sometimes penetrating into the pith. It pupates in the wood, and may hibernate there.

The damage to the tree may be very considerable; the early work of the larva is the most serious, in that the sap-flow is always reduced, and may even be stopped; stems and branches from 1–6 inches in diameter may be destroyed in this way. The only remedy is to remove all infested stems and branches during the winter months, and burn them. In this way the weevils are destroyed before emerging.

Icerya purchasi **and** *Novius cardinalis* **in Malta.**—*Colonial Reports, No. 786, Malta*, 1912-13, *London*, Jan. 1914, p. 12.

In the agricultural section of the report it is stated that during the spring of 1913 there was an outbreak in Malta of the fluted scale-insect, *Icerya purchasi*, in certain localities, but that, owing to the drastic measures taken and the timely distribution of the ladybird, *Novius cardinalis*, the spread of the pest was checked.

BAGNALL (R. S.). **Brief Descriptions of new Thysanoptera. II.**—*Ann. Mag. Nat. Hist., London*, xiii, no. 73, Jan. 1914, pp. 22-31.

Of ten new species of Thrips described, two are of economic interest, having been found attacking cultivated plants. These are *Scirtothrips signipennis*, found on the under leaf sheaths of banana in Peradeniya, Ceylon; and *Gynaikothrips karnyi* from the same locality, from marginal leaf-galls of black pepper (*Piper nigrum*).

BUSCK (A.). **The Chestnut Bast-Miner.**—*Insecutor Inscitiae Menstruus, Washington*, ii, no. 1, Jan. 1914, pp. 3-4, 1 fig.

A description is given of a new species of TINEIDAE, referred to by Mr. A. G. Ruggles as having an important bearing upon the spread of the chestnut bark disease [see this *Review* Ser. A, ii, pp. 29]. The new species which has been called *Ectoedemia phleophaga*, Busck, is closely allied to the other species of this genus which feeds on chestnut, the gall-making *E. castaneae*, Busck. The larva was found in the lower layer of the bark of a chestnut, encroaching upon the cambium. The mine is slender and serpentine, a few millimetres broad and several centimetres long; in April and May the fully grown larva leaves the mine and falls to the ground, where it makes a cocoon, often boring down a few inches into the loose surface soil. From the specimens reared, imagos emerged during September. The specimen described was taken at Falls Church, Virginia.

LABROY (O.). **A Borracha no Brazil.** [Rubber in Brazil.]—*Minist. da Agric. Indust. e Comm., Rio de Janeiro*, 1913, 153 pp. 99 figs.

The author says that in the rubber districts of the Amazon a species of termite, *Coptotermes marabitanos*, Silv., locally known as "broca," attacks by preference the tapping cuts on the trunks of *Hevea brasiliensis* and is somewhat difficult to combat. Maniçoba rubber (*Manihot glaziovii*) near Bahia is attacked by the larva of an insect of which the generic name is not given. The author says that at Machado Portella it is attacked by the same form as that found in the

district of Jequié, where, however, it is in most years not very abundant. This is a lepidopterous larva related to the Sphingidae. These larvae eat the leaves, especially in March and April, and also completely destroy manioc plants (*Manihot utilissima*). Zehntner found at Villa Nova a thrips which in various stages was attached to the lower surface of the Maniçoba leaves; as a result of the attack the leaves dry up and fall off prematurely. All green parts of the tree may be attacked and young trees up to two years old suffer most. A spray of 1 per cent. solution of nicotin or petroleum emulsion is useful against them, and it is sufficient to spray the young trees only. Ants are the most formidable pests of *Manihot*. Locusts, amongst them a species of the genus *Tropidacris*, also eat the leaves. Lesne has reported damage to *M. glaziovii* in the district of Baturité by a Curculionid, *Coelosternus rugicollis*, Boh., which in the larval stage bores short galleries into the end of the dead shoots or dead wood of the trunk. A Scolytid, *Xyleborus confusus*, utilises the galleries of *Coelosternus* and prolongs them, invading the whole tree. The best remedy appears to be to examine the trees and cut off all dead branches and see that the wound cicatrises properly.

POIRIER (L.). **Réunion viticole à Lyon.** [Meeting of vine-growers at Lyons.]—*Rev. Viticulture, Paris*, xli, 1st Jan. 1914, pp. 17-23.

M. Deville, Director of Agriculture in the Department of the Rhône, recommends lead arsenate against the vine moths, *Clysia ambiguella* and *Polychrosis botrana*, and the flea-beetle, *Haltica ampelophaga*, Guér. Nicotin may be used against the second generation of *Clysia* and *Polychrosis*. M. Jouvet, Director of the Côte-d'Or, stated that *Haltica* was reported at Vosne and at Volnay in the spring of 1913, but was controlled by non-acid sprays mixed with arsenates, which are also effective against mildew. M. Gillin, Director of the Puy-de-Dôme, said that *Rhynchites betulae*, L., had been abundant and the collection of its cocoons was effected in spite of the expense. *Clysia* had been methodically combated with nicotin, arsenic, or copper-nicotin. Bait-traps had been employed against *Polychrosis*. Efficient legal protection is asked for.

LARUE (P.). **Tableau indicateur des traitements insecticides.** [An indicator for the use of insecticides.]—*Rev. Vitic., Paris*, xli, 1st Jan. 1914, pp. 23-24, 1 fig.

The author points out that when engrossed in combating mildew the vine-grower often forgets to apply insecticides at the proper time and a table like the one dealing with *Clysia ambiguella* (Cochylis) prepared by M. L. Fulmek and published by the Vienna Station of Plant Pathology, would be very useful. This table measures 41 inches by 70 inches and on it a disk of 28 inches diameter is printed in colours with instructions in bold type beneath it. The disk is divided into 12 monthly sectors in which the various stages of the pest are depicted, so that a glance at the illustration, followed by reference to the instructions below, gives the required information.

CAZENEUVE (P.). **Le danger de l'intoxication arsenicale et plombéique en agriculture.** [The danger of arsenic and lead poisoning in agriculture.]—*Rev. Vitic., Paris,* xli, 8th and 15th Jan. 1914, pp. 29-34, 64-68.

Dr. Cazeneuve, a French senator and proprietor of vineyards in Beaujolais, adduces a large number of instances of poisoning due to lead arsenate used as an insecticide. Besides mentioning these most obvious cases, he refers to the warning given by Lewin, the well-known toxicologist of Berlin University, to the effect that harm may be caused without any immediate apparent symptom, and the serious functional derangement which results may be beyond remedy. On the authority of Lewin, the author states that the use of arsenicals, especially lead arsenate, is forbidden in Germany. As a practical vine-grower, he himself considers that lead arsenate is inefficacious against *Clysia* and *Polychrosis*. The 1913 season in Beaujolais was exceedingly bad for those growers who had continued the use of lead arsenate after the ill-success demonstrated in past years with this insecticide.

Notice concernant les conditions de vente de la Régie française. [Note on the sale of Nicotin by the French Régie.] *Rev. Vitic., Paris,* xli, 15th Jan. 1914, pp. 76-79.

The French Régie sells three varieties of nicotin:—(1) Ordinary standard tobacco-juice, containing exactly either 1 or 2 per cent. of nicotin; (2) strong standard tobacco-juice, containing exactly 4 per cent. of nicotin; (3) standard nicotin extract, containing 10 per cent. of nicotin. To ordinary consumers the prices are calculated per kilo. (2·2 lb.) of nicotin actually contained in the liquid, as follows: (1) 25 francs; (2) 28 francs; (3) 32 francs in tins of 5 litres each; 34 francs in tins of 1 litre; 40 francs in tins of ½ litre.

FEYTAUD (J.). **Les insectes xylophages de la vine.** [Xylophagous insects of the vine.]—*Rev. Vitic., Paris,* xli, 1st, 8th, 22nd Jan. 1914, pp. 5-7, 41-45, 94-99, 12 figs., 1 pl.

The xylophagous or wood-boring insects of the vine are less familiar to the grower than those pests which attack the leaves and the grapes. They are rarely the cause of the death of the stock or of injury which leads to the discovery of their galleries, as they are nearly always secondary parasites which establish themselves on stocks already weakened by age, by cryptogramic diseases, or by phytophagous or rhizophagous insects. In France the chief wood-borers are: *Cossus, Apate, Callidium, Clytus,* BUPRESTIDAE, TENTHREDINIDAE, and termites. The last-named will be dealt with in another paper.

Cossus cossus, L., is one of the most dangerous tree-pests. It principally affects the willow, but many fruit-trees, such as the apple, plum, cheery, and fig are attacked, as are also forest and shade-trees such as the elm, poplar, oak, chestnut, maple, ash, plane, etc. The damage is sometimes enormous. Until late years *Cossus* was held to be only a tree-pest, but its larva has been observed attacking vines in Algeria, the Bouches-du-Rhône, the Narbonnais, and the Haute-Garonne. The author has observed this species in some weak stocks in

the Gironde. Strong stocks are generally left untouched, but any weak ones within a short distance of infested willows, elms, etc., are susceptible to attack. Preventive measures then must aim at the removal of trees of this description and, if infested, their speedy destruction, or at least that of larva in them. A hooked wire will often bring away some of the larvae from their galleries, in which a plug of cotton-wool saturated with benzene or carbon bisulphide is then placed and the aperture sealed in order that the remaining larvae may be asphyxiated. The *Apate* bore into the dry shoots, and sometimes also into the living shoots of vines weakened by parasites of the roots (*Phylloxera*, etc.). The species found in France are numerous; *Apate sexdentata*, *muricata*, *sinuata*, *bimaculata*, *capucina*, and *monacha* being the principal ones. The insects appear in spring and enter the shoots at the base of a bud, boring galleries to the level of the corresponding knot. Mating and oviposition take place there. Four or five weeks afterwards the larvae hatch out and bore longitudinal galleries. They are sometimes so numerous as to destroy the wood between two knots in a few weeks. According to Valéry Mayet, *A. sexdentata* has two generations a year, oviposition occurring in May and September. The spring imagos oviposit on dead shoots, while the autumn brood may attack living ones. This species is found in Southern Europe, North Africa, and Asia Minor; it has been observed not only on the vine, but on fig, mulberry, chestnut, acacia, etc. *A. muricata* is similar to, but bigger than, *A. sexdentata* and causes the same damage. It is found especially in Italy, fairly often in Provence, more rarely in Languedoc. The vine, olive, oak, etc., are attacked. *Apate* (*Xylopertha*) *sinuata* is also found in the South of France and has been observed near Lyons and as far as the Landes. It attacks the oak, chestnut, and vine. *A. bimaculata* is also a southern species. It lives in dead Tamarix wood and also in the vine throughout the entire olive-growing region, in Provence, Italy, Greece, Asia Minor and Algeria. *A. capucina* attacks very hard woods and can even bore stones and leaden plates. It is found chiefly in the trunks of oak, chestnut, plum and mulberry, and on the vine also in the South of France. *A. monacha* is found in warm regions: Southern Europe, Palestine, Abyssinia, North Africa, Senegal and Congo. In Algeria *A. monacha* attacks the shoots of vines weakened by various causes, especially excessive salting of the soil.

The larvae of various beetles of the family CLERIDAE, such as *Denops albofasciatus*, *Tillus unifasciatus* and *Opilo mollis* prey upon the species of *Apate* in all their stages; while the larvae and eggs are destroyed by various entomophagous Hymenoptera, especially PROCTOTRUPIDAE (*Laelius perrisi*, *L. tibialis*, *Cephalonomia formiciformis*) and CHALCIDIDAE (*Pteromalus bimaculatus*).

If injury is being done by *Apate*, the first step is to clear the vineyard of all cut shoots. If living ones are attacked they must be cut off and burnt, and watering, manuring, etc., must be carried out until the vines have become strong and vigorous, healthy vines being immune. *Clytus varius* is a Longicorn beetle, the larva of which only attacks dead wood. *Callidium unifasciatum*, another Longicorn, attacks dead shoots or living branches of vines weakened by *Phylloxera* or any other cause; but it does so only rarely. *Agrilus derasofasciatus*, the Buprestid of the vine, is found everywhere in Europe

and in North Africa. Its larva lives in the bark and liber of the stocks and does little damage. Of the sawflies (TENTHREDINIDAE) *Athalia spinarum* eats the leaves, *Hoplocampa fulvicornis* attacks the grapes, and *Macrophya rufipes* tunnels the pith of the branches.

Report for 1912-13, East Africa Protectorate. — *Annual Colonial Reports*, no. 791, *London*, Feb. 1914, p. 30.

During the year under review there was no serious outbreak of any insect pest, although new ones have been met with, and the old ones have been more or less abundant. White grubs were reported to be doing more damage than hitherto, crops on badly cultivated land being most affected. The woolly apple aphis (*Eriosoma lanigerum*) has been found in new localities, and in spite of the inspection of imported trees it has been again introduced into the country. Cut worms in nursery beds have been destructive, especially in the case of tobacco. Numerous bugs and borers have been found on the coffee plantations. A study of these was made, as the coffee industry is likely to be one of some magnitude. Maize to the amount of 9,866 tons was passed for export, of which 628 tons were passed through the fumigating chambers.

PORCHINSKY (I. A.). **Очеркъ распространенія въ Россіи важнѣйшихъ вредныхъ животныхъ въ 1912 году.** [A Review of the spread of the chief injurious animals in Russia during 1912.] **«Ежегодникъ Гл. Упр. З. и З. по Департаменту Земледѣлія.»** [*Year Book of the Department of Agriculture of the Central Board of Land Administration and Agriculture*,] *St. Petersburg*, 1913, pp. 351-361.

The author opens with a general statement that on the whole, Agriculture in Russia suffered in 1912 considerably from various insect pests. In Asiatic Russia, and also in some eastern and south-eastern governments of European Russia, there were outbreaks of various species of locusts, which have invaded even the province of the Don and some parts of the government of Taurida, where *Caloptenus italicus* L., has appeared in great numbers. In the north and also in some parts of Middle Russia, the chief pest was *Euxoa* (*Agrotis*) *segetum* Schiff. It has been observed that these insects do not attack fields on which vetches have grown during the summer; the actual reason of this is not yet known and requires further investigation. Vetches have also proved very useful in combating another grass pest in North Russia, viz., *Chareas graminis*, which, in 1912, totally destroyed the grazing in the district of Jamburg, of the government of St. Petersburg. *Agrotis c-nigrum*, which has been considered to be little injurious, has done damage in the government of Vjatka, where its caterpillars appeared in the first half of May on winter-sown fields, feeding first on weeds and later on the crops. In South Russia considerable damage was done by *Oria* (*Tapinostola*) *musculosa* in the government of Ekaterinoslav. These pests have done more or less damage to nearly 45,000 dessiatines (120,000 acres) of crops, the loss

being estimated at about £250,000. The author refers also to *Phlyctae-nodes sticticalis*, *Eurygaster* sp., *Brachycolus noxius*, *Oscinis frit*, a[n]d *Pentodon*, and gives some information as to their appearance a[nd] injurious activities. In the government of Saratov a Capsid bug, *A...freyi*, Fieb., has been reported as injuring grain crops, while in previ[ous] years the same pest has damaged pastures and meadows in the sa[me] localities. *Coeliodes fuliginosus*, *Hylemyia coarctata* and *Aphis goss[ypii]* (on cottonseeds in the government of Erivan, Caucasia) were al[so] reported from various governments. A new Chalcid pest of clover se[ed] in Russia, *Eurytoma gibba*, Boh., was discovered by Kurdjumov in se[ed] samples from the governments of Poltava and Kiev, and by the Bur[eau] of Entomology (of the Central Board) in samples sent from the gover[n]ment of Orel; by mowing the clover for seed in autumn it is possi[ble] to separate the affected seeds from the healthy ones. The auth[or] mentions that the Entomological Station of Voronezh specially stu[dies] the biology of larvae of *Agriotes*, while the Station in Tula condu[cts] special studies on *Apion*. Amongst the insect pests of fruit gard[ens] he mentions *Psylla mali*, which affects the orchards of North a[nd] Middle Russia, while an undetermined species of *Psylla* is a danger[ous] pest in South Russia. *Euthrips pyri*, Daniel, is a new pest found [in] 1912 in the Crimea on apple and pear trees. The artificial importat[ion] of *Pentarthron semblidis*—a parasite of *Cydia* (*Carpocapsa*) *pomonell[a]* into the orchards of Tashkent, which was started in 1911, has result[ed] in the acclimatisation of the parasites in that country. Various spe[cies] of *Phyllotreta* have damaged market gardens, while the following pe[sts] of forests were reported to the Bureau:—*Agrilus viridus* injured bir[ch] trees in the Government of Samara; *Eulecanium corni*, B., appeared on hazel trees in the government of Kazan, the pests passing afterwards to orchards; *Lymantria dispar* was widely spread in the forests in the mountainous parts of the Crimea, where Mokrzecki has discovered a new parasite of it—*Hadronotus* (*Telenomus*) *howardi*.

The author gives also the following information specially relating to Siberia, according to reports received by the Bureau from K. N. Rossikov, who spent there the spring and summer of 1912. In vario[us] districts of the government of Enisseissk an outbreak of locusts too[k] place, chief amongst the pests being *Gomphocerus sibiricus*; the eg[g] clusters have infested an area of 100,000 dessiatines (270,000 acr[es]) and £17,500 was spent in control measures. In the same governme[nt] the crops were also injured by *Plectroscelis vittula*, *Hydroecia nict[itans]* and by larvae of Elateridae; the caterpillars of *Euxoa segetum*, i[n] company with the larvae of *Chortophila brassicae* and Aphids, hav[e] destroyed a great number of cabbages; *Hylemyia antiqua* was report[ed] as a pest of onions; *Phlyctaenodes sticticalis* was found over the who[le] government and in some parts has done great damage to vegetables. I[n] the province of Akmolinsk larvae of *Agriotes* and of *Trachea* (*Hade[na]*) *basilinea* have appeared in enormous numbers; in one locality a[s] many as 50 larvae of *Agriotes* were found on $6\frac{1}{4}$ square feet, the crops in these fields having been cleared off by the insects.

The Department of Agriculture has published, during 1912, six works on Entomology and republished five books. The author concludes by giving a list of the entomological Stations in Russia, the number of which, including the Bureau of the Scientific Committee to the Central Board of Land Administration and Agriculture, is 2[.]

The following is a list of towns in which Bureaux exist:—Moscow, Tula, Kursk, Charkov, Poltava, Ekaterinoslav, Cherson, Simferopol, Orel, Stavropol, Vladikavkaz, Astrachan, Tiflis, Tashkent, Kishinev, Kiev, Smiela, Voronezh, Baku, Riga, Orenburg, Kaluga, and Warsaw.

Ivanov (V. P.). **Замариваніе коконовъ Нафталиномъ.** [The destruction (of silkworm pupae in) the cocoon by means of Naphthalin.] **«Извѣстія Кавказской Шелководственной Станціи»** [*Bulletin of the Caucasian Silk-growing Station*] *for* 1913, *Tiflis*, 1913, pt. 3, pp. 1-8.

The Caucasian Silk-growing Station has made use of naphthalin as a means of destroying the pupae inside the cocoons. The advantages of this method, besides being more convenient than those already in use, are that the cocoons do not lose their brilliance and colour, which is not the case when the pupae are killed by means of steam. The author has been experimenting whether it would not be possible to use naphthalin also in case of cocoons which are intended for industrial purposes, and how far and in what way naphthalin will affect the qualities of the silk wound from such cocoons. As a result he concludes that naphthalin cannot be recommended. The minimum time necessary to kill pupae by means of naphthalin is about 48 hours.

Trjebinski (Dr. J.). **Experiment with Insecticides.—Отчетъ за 1912-й годъ объ организаціи и дѣятельности станціи охраны растеній въ Варшавѣ.** [*Report for* 1912 *on the organisation and activity of the Station for the Protection of Plants in Warsaw*,] *Warsaw*, 1913, 19 pp., 4 figs.

This is a report by Dr. Joseph Trjebinski on the Warsaw Station, which was established in 1911, and consists chiefly of a description of the organisation of the Station (buildings, staff, library, scientific apparatus, collections, etc.) and also short records of some experiments conducted there on remedies against fungus diseases of plants and on some insect pests. So far as the latter class of experiments is concerned, the report mentions:—(1) Experiments against Coccids on *Fraxinus excelsior*: the smearing of the branches of these trees with (*a*) milk of lime, (*b*) "Scalecide" (15 per cent.), (*c*) calcium polysulphide (15 per cent. and 20 per cent.), (*d*) carbolic emulsion (50 cm. of carbolic acid and 20 grms. of soap in one litre of water), (*e*) carbolineum and lime (15 grams of carbolineum and 150 grms. of lime in one litre of water), (*f*) naphtha soap emulsion (25 grms. of liquid soap, ¼ litre of water and ½ litre of naphtha, the whole being dissolved in ten times the amount of water), and (*g*) 5 per cent. solution of soda; which showed that the most effective remedies were soda, scalecide and naphtha emulsion, none of which injured the bark of the trees.

(2) Experiments against larvae of ELATERIDAE in strawberry-beds; these consisted in the digging into the soil of lime, saltpetre, sulphate of iron dissolved in liquid manure, and in burying trap potatoes; the results showed that while lime and saltpetre keep away the larvae from the roots of strawberries for a short time only, sulphate of iron has no effect at all, and the larvae were found in the potatoes only after the expiration of two weeks.

(3) Experiments against the larvae of *Melolontha* with ½ per cent. and 1 per cent. of Schweinfurt green sprayed on the roots of trees have failed, in nature as well as in the laboratory, as the insecticide did not affect the larvae, but injured the trees, causing the leaves to fall off.

Неудача съ яйцеѣдомъ плодожорки. [Failure with the parasite (*Pentarthron semblidis*) of *Cydia pomonella*.]—**«Туркестанское Сельское Хозяйство»** ["*Agriculture of Turkestan*,"] Tashkent, Dec. 1913, pp. 1198-1200.

An editorial note records a serious outbreak of *Cydia* (*Carpocapsa*) *pomonella* in the orchards of Tashkent in 1913 and the apparent failure to obtain the favourable results which have been expected from the parasites of the eggs of this pest imported from Astrachan. A case of one orchard is mentioned in which a small number of the parasites were released in September 1911; they hibernated in good condition, but developed in great numbers only at the end of the next summer, evidently having required the first half of the summer for multiplication. In the autumn of 1912 there was not a single apple in this orchard which was not infested by *C. pomonella*. Owing to the great number of parasites which were noticed at the end of that summer, it was expected that the number of hibernating specimens would be greater and that the latter would develop and prove more useful in 1913; but it appeared that the number of parasites in 1913 was very small, while the numbers of *C. pomonella* were enormous. The writer of the article is at a loss to explain the reason for this failure and suggests that either the parasites themselves destroyed last summer all the eggs in which they could have wintered, or that they have been removed from the orchard with the harvest of apples. In view of the serious injury done to the orchards of Tashkent by the pest and to the failure or cost of other remedies, it is suggested that evidently the parasites must be bred artificially in the laboratory of the Entomological Station and let loose in the orchards early in spring.

A Suggestion for trapping *Pachydissus sartus*.—**«Туркестанское Сельское Хозяйство»** ["*Agriculture of Turkestan*,"] Tashkent, Dec. 1913, pp. 1226-1228.

A correspondent suggests as a remedy against the Longicorn *Pachydissus sartus*, Sols., the use of trap trees, the bark on some parts of which has been removed to expose the wood. He contends that such trees would attract the beetles, and could be destroyed as soon as they had become infested. This method is successfully applied against various SCOLYTIDAE. In a reply, V. Plotnikov does not approve of this method under the conditions prevailing in Turkestan, where there are no large forests. Besides he is not satisfied as to the suggested method of preparing the trap trees, for his experience has proved that these beetles are not attracted to rings on trees made by removing the bark; and even if the trees should be cut down and left lying, he doubts whether they would attract the insects in sufficiently large quantities. Pending further investigations, he repeats his previous recommendations, *i.e.* to remove and burn the damaged trees before the spring and again later in the season.

KULAGIN (N. M.). Главнѣйшія вредныя насѣкомыя для полеводства въ Европейской Россіи въ послѣднее двадцатилѣтіе. [The principal Insect Pests of field-crops in European Russia for the last 20 years.]—Ежегодникъ Гл. Упр. З. и З. по департаменту Земледѣлія, [*The Year-book of the Department of Agriculture of the Central Board of Land Administration and Agriculture*], *St. Petersburg*, vi, 1913, pp. 585-638, 1 plate.

The author reviews in this article the appearance and distribution of and damage done by the principal insects injurious to field-crops for the past 20 years in Russia, together with the more important measures for fighting the pests undertaken by the Zemstvos. He first deals with *Anisoplia austriaca*, Herbst, and gives a table showing the years of the appearance of this beetle in 25 different governments of South and Middle Russia for the period 1894–1912. It appears that this insect is a constant pest in the governments of Cherson, Taurida, Ekaterinoslav, Kiev and Charkov, while in most other parts, even in South Russia, it occurs much less frequently. In some years, such as 1897, 1900, 1901, 1910 and 1912, the insects appeared over a very wide area; while in other years, such as 1904–1907, only five governments complained of their depredations. In some districts the beetles appear during a number of successive years, but most frequently there is an interval of 2–3 years in their appearance in the same area, while in other cases—Bessarabia, Stavropol—this interval reaches 7–8 years.

Mayetiola (Cecidomyia) destructor, Say, has been noticed in 41 governments, a list of which, with the years of the appearance of the pest, is supplied. It appears that it has been found as far north as Pskov (1894 and 1904) and Viatka (1898) and in most parts of Middle and South Russia, but the damage done by these flies is more constant and chronic in the southern governments, while the outbreaks in Middle Russia and in the north take place at longer intervals. As a rule their multiplication depends a great deal on the meteorological conditions of the spring and autumn, a rainy spring being favourable for their development; but the author points out the years which proved exceptional in this respect.

Oscinis frit, L. Records are given of the appearance of this pest in 21 governments, from 1894 to 1912, as well as information as to outbreaks since 1837, when one took place in Kurland. In Bessarabia this fly is considered to have been the chief pest of field-crops during recent years. The author mentions the fact that only in those governments where there are entomological organisations is the damage by these insects kept on record separately from that done by *Mayetiola destructor*. As a rule these two flies become abundant in the same years, although contrary cases are also known. It is stated that *O. frit* sometimes appears persistently in a limited locality, as is the case in the experimental fields of the Moscow Agricultural Institute, where they cause considerable damage every year.

Cephus pygmaeus, L., and *C. tabidus*, F., have been recorded in 26 governments, and a table is given with information as to their appearance in each year from 1893 to 1912. They are more injurious and

appear more frequently in some southern governments (Cherson, Taurida, Ekaterinoslav, Charkov). The damage caused by these pests is variously estimated at from 14 to 20 per cent., although there are cases in which the damage was much more serious. In 19[illegible] in the government of Kiev, these insects only attacked fields already damaged by *M. destructor*.

Euxoa (Agrotis) segetum, Schiff. Records have been compiled of the appearance of this important pest in 34 governments, it being found as far north as Vologda, St. Petersburg, and Viatka, where it was noticed in 1838. In the government of Tula the caterpillars have appeared in great numbers every year from 1901 to 1910, with a sudden decline in 1907. The intervals between the years of maximum occurrence vary in different parts of the country. Sometimes the pests do little damage, although appearing in great numbers, as was the case in Tula in 1910.

Oria (Tapinostola) musculosa, Hb., is a South Russian pest; from the table supplied it appears that it has been observed in 10 governments. The intervals between outbreaks are considerable.

The author deals in the same way with *Locusta (Pachtylus) migratoria*, L., and various other species of locusts; also with Thrips (which are tabulated for 18 governments); the Pentatomid bugs, *Eurygaster maura*, F., *E. marrocana*, F., *E. integriceps*, Osh. (in 11 governments, mostly in South Russia); the Elaterid beetles, *Agriotes segetis*, Bjerk. and *Athous niger*, L. (in 19 governments); *Hydroecia nictitans*, Bkh. (in 14 governments of South and North-east Russia, the most frequent outbreaks having occurred in Ufa); and with *Lema melanopa*, L., which is recorded from 9 governments of South Russia.

With regard to the general factors influencing the occurrence and periodicity of insect pests, the necessity for further research is emphasised. The first Zemstvo to appoint an Entomologist was that of Taurida in 1893, Cherson being the next to follow this example in 1897. Some Zemstvos while not having a permanent Entomological Station, invite yearly the services of specialists or apply to the Central Government for such men. Other Zemstvos assign this task to their "agronomists," who give popular lectures to the peasants on various insects and remedies for them, with demonstrations, leaving the actual combating of the pests to the public, though in some cases they also supervise the technical part of the campaign. The author proceeds to review other activities of the Zemstvos, so far as the fight against insect pests is concerned, which include:—bye-laws regulating the campaign against any particular pest; the issue of posters, pamphlets, etc., acquainting the public with the various aspects of this question; the supply, sometimes on advantageous terms, of sprayers, insecticides, fungicides, tanglefoot, etc., to the public; subsidies to various Agricultural or Natural History Societies; the payment of premiums for the collection of various pests, etc.

The author gives a list of the literature used by him for his review and goes on to describe more fully the control measures against *Euxoa segetum*, *Mayetiola destructor*, and *Anisoplia austriaca*.

LECAILLON. **Sur la fécondité du Négril des luzernes** (*Colaspidema atra*, Latr.). [On the fecundity of *Colaspidema atra*, Latr.]—*C. R. Acad. Sci., Paris*, clviii. no. 2, 12th Jan. 1914, pp. 137-139.

The small beetle, *Colaspidema atra*, Latr., called in France "Négril," on account of its black colour, causes serious damage every year to lucerne crops in the neighbourhood of Toulouse. It is common in other parts in the south of Europe. In May and June the hibernating adults appear, and soon after the larvae are found in the fields of lucerne. The present paper deals with experiments made to determine the number of eggs laid by the female during her lifetime, and the results indicate that a single female may lay almost 1,000 eggs from April to June. This degree of fecundity was maintained both when fertilisation occurred only once or was repeated several times. The degree of fertility in different individuals was very variable.

LAMBORN (W. A.). **The Relationship between certain West African Insects.**—*Trans. Entom. Soc. London for* 1913, *London*, iii, 21st Jan. 1914, pp. 436-524, 4 pl.

The observations recorded in this paper, upon the relationship between certain insects, were made at Oni, in Southern Nigeria, in a bush camp, situated 70 miles E. of the town of Lagos and about 10 miles from the sea. Although most of the work done is of purely scientific interest, certain points are noted which are of economic importance. The larvae of three Lycaenid butterflies, *Aslauga vininga*, Hew., *A. lamborni*, Bethune-Baker, sp. n., and *Spalgis lemolea*, H. H. Druce, were found to feed on Coccids; and the same habit is recorded of the larvae of two moths, *Eublemma ochrochroa*, Hmp., and *Tortrix callopista*, Durrant, sp. n.

In an account of the Homoptera (PSYLLIDAE and COCCIDAE) collected by Mr. Lamborn, Prof. Newstead describes a new species of Psyllid, *Rhinopsylla lamborni*. The Coccids collected were *Stictococcus sjöstedti*, Newst., one of the recognised cocoa pests of Western Africa, *Pseudococcus* (*Dactylopius*) *longispinus*, Targ., *P. virgatus* var. *madagascariensis*, Newst., and *Lecanium punctuliferum*, var. *lamborni*, var. n.

BEAUCHER (R. W.). **An Undesirable Foreigner on the American Continent** (*Cryptococcus fagi*, Baerens).—*Canad. Entom., London, Ontario*, xlvi, no. 1, Jan. 1914, pp. 14-15.

The author received, in October 1913, specimens of bark from a common beech tree covered with an insect which was stated to be noticeable all through the woods in the vicinity of Halifax, N.S. Dr. Howard identified it as the European felt scale (*Cryptococcus fagi*, Baerens). In Britain this insect confines its attacks to the beech (*Fagus sylvatica*), the copper beech being all but immune. The specimens from Nova Scotia are doubtless from the American beech (*F. grandifolia*, Ehrh.), an entirely new food-plant, and prompt measures should be taken for its extermination, since it would appear that the insect is taking well to its new conditions. This seems to be the first record of the occurrence of this Coccid in North America.

Hewitt (C. G.). Note on Occurrence of the Felted Beech Coccus (*Cryptococcus fagi*, (Baerens) Dougl.) in Nova Scotia.—*Canadian Entomologist, London, Ontario*, xlvi, no. 1, Jan. 1914, pp. 15-16.

Dr. Hewitt, after reading Mr. R. W. Braucher's article on *Cryptococcus fagi*, notes that in August 1911 specimens of the felted beech Coccid, *C. fagi*, were sent to him by Mr. Justice Meagher of Bedford, N.S. Investigation then showed it to be present on both ornamental and forest beeches in the neighbourhood of Halifax, where it has existed for years, Mr. R. Power, Superintendent of the Public Gardens, Halifax, having known it for twenty years. Efforts should be made to prevent its spread. Theobald has found the Woburn Wash of Mr. Spencer Pickering to be a most successful remedy. This is made as follows:—Soft soap, ½ lb.; kerosene, 5 pints; caustic soda, 2½ lb.; water, 9½ gals. The soap is dissolved in hot water, then the oil mixed in, then the soda, and the whole brought up to ten gallons with water. An effective summer wash is made by boiling together 8 lb. soft soap and 5 gals. of kerosene. On cooling this becomes a jelly, and for use 10 lb. of the jelly is added to 30 gallons of water. The best results have been obtained by scraping off the Coccids and scrubbing with the kerosene wash.

Meeting of the Entomological Branch, Ottawa Field Naturalists' Club.—*Ottawa Naturalist, Ottawa*, xxvii, no. 10, 30th Jan. 1914, pp. 135-139.

At the meeting of the Entomological Branch held on 8th Jan. 1914 some oak twigs were shown from Meach Lake, Que., from which had been reared the Cerambycid, *Elaphidion parallelum*. The larva tunnels the twigs for several inches and pupates in them, finally emerging through the base of a broken twig. This beetle is related to the Oak Twig Pruner, *Elaphidion villosum*, which was injurious to oaks in the St. Lawrence Island Parks in 1912 and 1913. The habit of the latter species is to girdle the twigs, causing them to drop.

Another subject discussed was the habits and life-histories of the various species of June Beetles (*Lachnosterna*); it was stated that the distribution of the various species is often quite local, owing to each having preferences in matters of soil and moisture in their breeding places. When hibernating some species remain at a depth of less than a foot below the surface of the soil, while others have been found at depths varying from 47–91 inches. Mention was also made of the remarkable manner in which skunks seek out the larvae for food, thereby doing much good.

Grove (A. J.). Some experiments with Maize stored in bins.—*Agric. Jl. of India, Calcutta*, ix, pt. 1, Jan. 1914, pp. 92-98.

In October 1912 some experiments were started to test methods for protecting stored maize, kept for feeding cattle, from the attack of insects. The grain to be treated was kept in large cylindrical bins. One bin contained maize which had been fumigated with carbon bisulphide; a second, maize that was unfumigated, but in which naphthalene was suspended in muslin bags; in a third the maize was fumigated and naphthalene was also used. A fourth containing

unfumigated grain and no naphthalene served as a control. The insects found were *Rhizopertha dominica*, *Tribolium ferrugineum*, and *Calandra oryzae*; of these *T. ferrugineum* is harmless, living merely in the dust amongst the grain. The results show that storing with naphthalene is practically as effective as fumigation with carbon bisulphide; that it has no bad effect on the grain from the point of view of its suitability as food for cattle and that it does not alter the germinative capacity to any appreciable extent. It has the following advantages over fumigation with carbon bisulphide:—It is easy to use, and is less dangerous, no special apparatus being necessary; the cost is less and the effect is continuous, whereas carbon bisulphide must be allowed to evaporate and any insects which gained access to the grain after that would breed unchecked.

In the experiments described, flake naphthalene was used at the rate of 1 lb. per bin, the bin being 6 ft. high and 3 ft. in diameter, holding between 25 and 30 maunds (2,000–2,400 lb.) of maize. The naphthalene was divided into four parts, each of which was wrapped in a muslin bag and suspended at different levels in the bin. It is important that the naphthalene should not mix with the grain, and before feeding the grain to cattle it should be exposed to the sun for from 6 to 12 hours.

Adcock (G. H.). **Phylloxera.** *Jl. Dept. Agric. of Victoria, Melbourne*, xii, pt. 1, Jan. 1914, pp. 51-55, 3 figs.

An account is given of the habits and life-history of *Phylloxera vastatrix*, with an historical description of its discovery in America and its introduction and spread in Europe. In 1875 it was introduced accidentally into Victoria in some vines imported from Europe; the first attacks were noticed near Geelong. Under legislative authority whole areas of vines were destroyed to annihilate the pest, but in spite of this further attacks occurred in the Bendigo, Goulburn Valley and Rutherglen districts, where similar measures were taken, but with as little success. These attacks caused a considerable set-back to the important industry of viticulture in Victoria; it is, however, steadily recovering, owing to the reconstitution of the vineyards with American resistant vines.

Hempel (A.) **As Cigarras do Cafeeiro.** [Coffee Cicadas.]—*O Fazendeiro, S. Paulo*, vi, no. 3, March 1913, pp. 92-93, 6 figs.

The author figures and briefly describes *Fidicina pullata*, Berg, and *Carineta fasciculata*, Ger. These two species occur together in Brazil, though the former is more numerous in Caconde and the latter in Campinas and Itatinga. They were first noticed by coffee-planters in 1901 in Caconde, and have since been recorded from various widely separated localities in the State. On uncultivated land the insects feed, in their larval and nymphal stages, upon the roots of indigenous trees. When the bush is cleared and coffee planted on the same ground, the nymphs speedily adapt themselves to the new conditions and feed upon the roots of the coffee trees, doing considerable damage. It is recommended that when the presence of cicada nymphs is suspected the soil should be turned over round the roots of the coffee.

La Langosta. [Locusts.]—*Bol. Fomento, San José, Costa Rica*, iii, no. 11, Nov. 1913, pp. 830-831.

The following experiment was made in Nicaragua upon a swarm of locusts which covered an area of 500 yards by 200 yards. This swarm had proceeded in a solid column eating up everything which it encountered in its path. A poison was prepared with 1 lb. of arsenate of soda mixed with 4 lb. of brown sugar and dissolved in a large vessel of boiling water; cold water was then added in a quantity sufficient to make 10 gallons of the solution. Six good handfuls of green barley (any other sort of green fodder may be used), weighing altogether 36 lb., were dipped in the arsenical solution for 15 or 20 minutes, until completely saturated. The poisoned barley was then distributed over the greater part of the swarm. The first effect was to stop the advance. The locusts attacked the bait with great voracity, consuming the whole of it. The next morning the few that were not dead were intoxicated and died quickly when sprinkled with a little of the solution. The living, as usual, ate the dead and large numbers were killed in this way. In about four days the whole swarm was destroyed. The author notes that a number of birds which ate the poisoned locusts did not appear to be in any way affected.

Gorkum (Dr. N. van). **Dactylopius sacchari brasiliensis.**—*Boletim da Estação Experimental de Canna de Assucar de Escada, Estado de Pernambuco, Recife*, i, no. 1, April-June 1913, pp. 29-31, 1 pl.

This scale-insect is found in various stages of development chiefly on that part of the stem of the sugar-cane which is just below the surface of the soil and on the crown of the roots. The bugs also crawl up the stem and attach themselves to the underside of the leaves, preferring the young shoots. The presence of the insect is indicated by the intense red colour which the leaves acquire at their base.* The scale will live on any species of cane, even on *Saccharum spontaneum*, a wild species, and the damage done is such as to interfere greatly with the growth of the plant. Any direct and radical remedy is very difficult of application, because the bugs tend to collect between the stem and the leaves, and the latter cannot be removed without damage to the plant. The best remedy is to disinfect the cane thoroughly before planting with Bordeaux mixture, which kills both the bugs and the eggs.

The author thinks it possible that the various species recorded from sugar-cane in different parts of the world are possibly only varieties of one species, and in order to distinguish the insect which he himself has dealt with and which was found for the first time in the State of Sergipe, he proposes to call it *Dactylopius sacchari brasiliensis*, sub. sp. nov., a brief description being given.

Plagas de la Agricultura. [Pests of Agriculture.]—*Bol. Minist. Agric. Buenos Aires*, xv, no. 5, May 1913, pp. 520-521.

A table is given showing the destruction of locusts in the various provinces of the Argentine, from which it appears that 2,381 tons of insects were destroyed in the month of April 1913.

BRIGGI (A.). **Monografia Sobre el Cultivo del Algodon en la Republica Argentina.** [The cultivation of Cotton in Argentina.]—*Reprint from Bol. Minist. Agric. Buenos Aires*, 1913, 22 pp.

The author mentions that although there is nothing which can be called a serious pest of cotton in the cotton-growing districts of the Argentine, yet the cotton worm, *Alabama argillacea*, is fairly common, but can be easily combated by the use of Paris green in powder at the rate of 1 to 2 lb. per acre.

SALVADORES (A. Z.). **El Durazno.** [The Peach.]—*Reprint from Bol. Minist. Agric. Buenos Aires*, 1913, 33 pp., 56 figs., 17 pls.

Amongst the pests of peaches in the Argentine, the author names *Diaspis pentagona*, and recommends for its destruction neutral "Acarina," 4½ per cent. solution in summer and 15 to 20 per cent. in winter. Calcium sulphides may also be used in winter, being prepared by boiling 12 lb. of lime in 4 gals. of water and adding 8 lb. of sulphur in powder: 4 gals. of water are then added, and the whole boiled for two hours. Both preparations should be laid on with hard brushes, but sprayers may be used for the upper parts of the trees. Attempts are being made to acclimatise certain enemies of the scale, especially the Coccinellid, *Rhizobius lophantae*, and various Chalcids of the genus *Prospaltella*. There is a native Coccinellid (*Coccidophilus citricus*) which is generally to be found in summer on lemon and orange trees in the province of Buenos Aires, and appears to feed upon *Lepidosaphes beckii*, which is a pest of these plants. It has also been observed to have a predilection for *Aulacaspis* (*Diaspis*). The artificial propagation of this insect is advocated.

Aphis persicae (the peach aphis) attacks the tender shoots and leaves, killing them and thereby causing the death of the tree. It can be controlled by spraying the affected parts in spring with a 5 per cent. extract of tobacco. The operation should be carried out in the evening and again on the following morning. The tree should subsequently be sprayed with water in order to remove the nicotin. A 5 per cent. solution of lysol with 0·6 per cent. of soft soap in water may also be used. It is useful in winter to brush the trunks of the principal branches with milk of lime. The plants that have been attacked in the previous spring and summer, and especially the ends of the one-year-old branches, should be washed in every part with a 3 per cent. solution of soft soap. It is also desirable to collect and destroy the tips of badly attacked branches, and all trimmings and prunings.

An Act Respecting the Protection of Plants from Destructive Insects and Fungoid Diseases.—*Quebec Assembly Bill*, no. 32, 1913.

Under this Act the Entomologist of the Department of Agriculture of the Province of Quebec is given the right to enter any nursery, orchard, or other premises where it is believed that plants are kept, and any resistance to this action is forbidden. The existence and spread of any insect pest must be reported, and all instructions regarding the treatment or destruction of infested plants must be carried out by the owners. After the Entomologist has ascertained the existence in a nursery of any one of the pests enumerated, no plants may

be removed from that nursery until a certificate stating that they are fit to be transferred has been obtained from the Entomologist or his assistant. The Minister may authorise certain persons, for scientific purposes only, to import specimens of the destructive pests. No compensation for expenses incurred or damages suffered through the treatment or destruction of any plants, trees, or other vegetable matter attacked by any of the destructive pests shall be allowed by any court when such expenses result from the instructions of the Entomologist. Among the destructive insects to which this section applies are expressly included the San José Scale (*Aspidiotus perniciosus*, Comst.), the brown-tail moth (*Euproctis chrysorrhoea*, L.), the gipsy moth (*Lymantria* (*Porthetria*) *dispar*, L.), and the woolly aphis (*Schizoneura lanigera*, Hausm.) Between the 15th June and the 15th September of each year the Entomologist or his representative shall visit all nurseries in the Province in which plants are grown for commercial purposes, in order to ascertain the existence in such nurseries of any of the destructive insects or plant diseases, and if such insects are not present a certificate shall be issued which is valid up to the inspection next year. Unless such a certificate is obtained, after the 15th December 1914 every owner or person in charge of a nursery in the Province is forbiddedn to move any plant outside the nursery.

PATCH (E. M.). **Woolly Aphid of the Apple.**—*Maine Agric. Expt. Sta., Orono, Bull.* no. 217. Oct. 1913, pp. 173-118, 6 pls.

This Bulletin is practically identical with Bulletin 203 [see this *Review*, A, i, pp. 24-26].

PATCH (E. M.). **Woolly Aphids of the Elm.**—*Maine Agric. Expt. Sta., Orono, Bull.* no. 220, Nov. 1913, pp. 259-298, 6 pls.

The author deals with the elm aphids of the Eastern United States belonging to the genus *Schizoneura*. Among the points of specific value in separating these aphids are the antennae of the stem females, the wax glands of the apterous generations and the antennal characters of the winged females. The habitat and the species of the elm concerned are also of much significance. Among the species considered in this bulletin is the woolly aphid of elm bark, *S. rileyi*. It is not uncommon to find the trunks and branches of young elms with the tender places in the bark closely packed with colonies of this species. Descriptions of the distinguishing features of the different generations are given, the antennae especially being described and illustrated. Elm rosette or leaf-cluster aphid, *S. lanigera*, and the northern curl of American elm, *S. americana*, are here treated separately, though the author states that there seems to be no ground for separating the two except the nature of their elm habitat [see this *Review*, Ser. A, i, pp. 24-26.] The author also notes that the life-cycle of the leaf-roller of elms, *S. ulmi*, includes a residence on the roots of currants and gooseberries, the form which occurs on *Ribes* being known as *S. fodiens*. Specimens identical with *S. ulmi* (*fodiens*) have been collected in California, Oregon, Maine and Ontario.

The Bulletin concludes with a food-plant catalogue of the APHIDIDAE of the world.

FLETCHER (T. B.). **List of Insect Pests of Cultivated Plants in Southern India.**—*Madras Dept. Agric., Coimbatore,* note no. 1 of 1913, 8th Oct. 1913, 15 pp.

This is a list of the principal crop-pests of Southern India, and contains information regarding 275 different species, giving their distribution, the crops they attack, and remarks as to their relative importance. The list does not purport to be complete, as new pests are constantly coming to light. The insects dealt with are referable to the following orders :— Hymenoptera 5 species, Coleoptera 61 species, Diptera 8 species, Lepidoptera 119 species, Rhynchota 64 species, Orthoptera 15 species, Isoptera 2 species and Thysanoptera 1 species. It should prove a very useful pamphlet, and the tabular arrangement adopted is very handy for reference.

MOLZ (E.) **Chemische Mittel zur Bekämpfung von Schädlingen landwirtschaftlicher Kulturpflanzen.** [Chemical means of combating pests of cultivated plants.] *Zeits. Angewandte Chemie, Leipzig* xxvi, nos. 77 & 79, 26th Sept. 1913 and 3rd Oct. 1913, pp. 533-536, 587-588.

The paper deals with the chemistry of insecticides and fungicides, the action of chemicals upon insects and parasitic plants and on the host plant, and with the possible risks of injury to man or animals by the use of these substances.

Copper sulphate, which has long been used as a fungicide, has only of recent years been regarded as a useful insecticide. GUILLON in central and southern France found that a copper-lime mixture was effectual against grasshoppers, and in 1911 the author, as the result of direct experiment, found that the same mixture protected foliage from the attack of caterpillars ; in both cases the effect being due not to the lime, but to the copper salt. It was found that solutions containing less than 2 per cent. of copper sulphate were useless, to which fact is attributed the failure in certain cases to destroy pests with this preparation.

Sulphur is a useful remedy against many insects, especially against red spider (*Tetranychus*) and flea-beetles, e.g. *Haltica ampelophaga*, upon which it acts not only as a direct poison but as a repellant. In some cases this has had the undesired effect of driving away insects which are useful in destroying harmful insects, as in a case observed by the author when the application of sulphur to vines to rid them of the vine moth resulted instead in the destruction of the earwigs, a natural enemy of these pests. Sulphur is often applied in the form of a polysulphide of potassium ($K_2 S_5$), the liver of sulphur of commerce. Liver of sulphur must not be used stronger than 1 lb. in 20 gals. of water, otherwise the foliage is damaged. The author prepared a very satisfactory mixture as a remedy for red spider by adding 23 per cent. of soft soap to the liver of sulphur mixture, whereby the efficiency was greatly increased. More important than liver of sulphur is the lime-sulphur mixture. In America this has proved a valuable remedy against the San José scale (*Aspidiotus perniciosus*), and has been used successfully in Germany, where it is known in commerce as "Californische Brühe." It is prepared by boiling a mixture of

burnt lime and powdered sulphur in a small quantity of water; in concentrated solution it is a brownish-yellow liquid, and can be easily diluted with water. The quick lime, sulphur and water are boiled in an iron vessel. The formula used in America is as follows:—1 part by weight quicklime, 2-2·25 parts sulphur and 9-11 parts water. The lime must be as pure and as fresh as possible, otherwise it contains a large quantity of carbonic acid, which renders it useless. As a by-product calcium thiosulphate (CaS_2O_3) is formed, which is soluble in water, but which, on standing in the air, precipitates as insoluble calcium sulphite ($CaSO_3$) and free sulphur; the calcium sulphite remains at the bottom of the vessel and the sulphur enters into fresh combination with the lime. Lime-sulphur mixture may be prepared either in the concentrated form or ready for use. In the former case 42 lb. sulphur and 19 lb. lime are used to 22 gallons water. For winter spraying the proportions are 8 lb. sulphur and 10½ lb. lime to 22 gals. water. The boiling should not last over an hour. When the liquid is cool its specific gravity is tested by means of a Beaumé's hydrometer. In America the commercial product is 32-34° Bé., in Germany usually 20° Bé. The mixture should be used as soon as possible, but it may be kept in well-closed vessels for a month. Contact with the air causes precipitation of reddish brown crystals of the pentasulphide and tetrasulphide of calcium.

Carbolineum is now recognised as a universal remedy against insect pests, as a result of much experimental work done notably by Aderhold, Hiltner, Lüstner, Schander, Fulmek, Zimmermann, Wahl and Schwartz. Carbolineum is a distillation product of coal or wood tar. Soluble carbolineum is prepared in commerce in many forms and under various names. Netopil (1909) showed that the commercial products differed widely in their chemical and physical characters, and Aderhold and Lüstner showed that some of these products were actually harmful instead of beneficial to plants. With the purpose of ascertaining what in such products were beneficial and what harmful, the author conducted some experiments in 1909 and 1910 in the Flörsheim chemical works. In these experiments 30 different tar-oils were tried, including raw tar-oil, phenol-free tar-oil, base-free tar-oil, phenol and base-free tar-oil, raw base and raw phenol from tar-oil. Of each kind of tar-oil, 2 light oils, 3 medium oils and 2 heavy oils were tried. The results were shortly as follows. Insecticidal action is most marked with light oils. Aphids were killed by all the oils, but the oil entered into the galls and destroyed the adjoining tissues; this was less marked in the case of heavy oils than with medium or light oils. Soluble tar-oil can be used in 10 per cent. solution against Aphids, but it must not be allowed to touch the green parts of the plant. Against caterpillars the best results were obtained with the bases and phenol from the tar-oils. A 5 per cent. solution in water of raw phenol is sufficient to kill caterpillars of *Pieris brassicae*, the efficiency rising with the concentration. Green parts of plants are sensitive to a 0·5 per cent. solution, so that carbolineum is only really satisfactory when used before the trees are in leaf. For killing insects in the ground light oils were the best, but these were only satisfactory for insects near the surface of the soil. Damage to foliage is greater in the case of heavy oils than of lighter oils, and of all the constituents of tar-oil the phenol is the most harmful to plant tissues.

Soap is an important contact insecticide, and most contact poisons contain it in greater or lesser proportions, such as, for example, quassia-soap mixture, Dufour's worm poison and Nessler's remedy for Aphids. The most essential character of a contact poison is its power to soak into the hairy or waxlike covering of insects. This power depends, according to VERMOREL and DANTONY (1910), on the surface tension of the liquid used; this can be measured by counting the number of drops formed by 5 c.c. of the liquid when passing through a pipette that allows 5 c.c. of distilled water to pass out in 66 drops. For beetles, such as *Haltica ampelophaga*, *Rhynchites betuleti* and *Adoxus vitis* a soap solution of strength 5 : 10,000 is sufficient to kill; this strength corresponds with a surface tension of 192 drops for 5 c.c. of the liquid. For the webs of *Hyponomeuta* a solution of 1 : 1,000 must be used. The addition of soap to insecticides is principally to increase their power of moistening the coat of the insect; to mixtures which contain acids or inorganic salts it is useless to add soap, as the latter will be precipitated.

Nicotin is an important ingredient in many insecticides. In the form of tobacco extract it is an important contact poison; more recently it has been found to be an efficient stomach poison and has been used successfully against *Clysia ambiguella* and *Polychrosis botrana*.

Still more important than nicotin as a stomach poison is arsenic, in the form of Schweinfurt green and lead arsenate. The question as to whether the fruit is poisoned on trees treated with arsenic compounds has occupied attention; probably there is no risk, as the spraying is carried out, in the case of vines, for example, early in the year, and by the time the fruit appears all traces will have been washed away, or what little remains will be in such minute quantities that it can be eaten without harm resulting.

The paper concludes with an account of fumigation with hydrocyanic acid, as practised in America.

SACHAROV (N.). **Біологія восклицательной совки и озимой по наблюденіямъ въ Тульской и Тверской губ. въ 1909-1910 годахъ.** [The biology of *Feltia* (*Agrotis*) *exclamationis*, L., and of *Euxoa* (*Agrotis*) *segetum*, Schiff., according to observations in the Govts. of Tula and Tver in 1909-1910.]—*Published by the Entom. Sta. of the Astrachan Soc. of Fruit-growing, Gardening, Market-Gardening and Field Cultivation. Astrachan*, 1913, pp. 17, 1 fig.

These observations on *Euxoa segetum* and *Feltia exclamationis* were conducted in the district of Novotorzhok of the government of Tver and in the district of Bogoroditzk of the government of Tula. In Novotorzhok the moths of both species were on the wing from 3rd July to 2nd August, the maximum being reached about the middle of July. In the government of Tula the flying of the moths started, notwithstanding the cold weather prevailing, on 4th June, reached its maximum on 2nd July and decreased after 28th July. The numbers of *E. segetum* decreased in the first half of July and the females contained fewer eggs; while *F. exclamationis* increased at this time, and the majority of females contained their full complement of eggs. Of the moths captured from 29th June to 7th July, 36 per cent. were *F. exclamationis* and 64

per cent. *E. segetum*; while of the latter 41 per cent. were females, and of the former 36 per cent. In the second generation the proportion of *F. exclamationis* was only 15 per cent.

The principal weeds on fallow fields in the district in Tver, where they are not used for pasture, are: *Polygonum convolvulus, Cirsium arvense, Sonchus arvensis, Atriplex tataricum, Rhinanthus cristagalli* and various species of *Plantago*. In the area in Tula the fallow land is used for pasture and the principal weeds are: *Polygonum aviculare, Malva rotundifolia, Rhinanthus crista-galli, Artemisia campestris, Convolvulus arvensis, Linaria vulgaris* and various species of *Carduus*. In nature the moths oviposited on all weed grasses, except *R. crista-galli*, which is apparently avoided on account of its hairiness. Oviposition lasts from 18 to 34 days, *E. segetum* starting earlier than *F. exclamationis*. In Novotorzhok the development of the caterpillars lasted 63 days for *F. exclamationis* and 68 days for *E. segetum*; while in Bogoroditzk the figures were 51 and 46 days respectively. There were two generations of the moths in the government of Tula, although the author is not in a position to say that this is permanently the case; in the year of observation there was an exceptionally early spring, which accelerated the appearance of the wintering generation and the development of its descendants. Of the hibernating larvae obtained by the author only 8 per cent. produced moths; of the remainder about 74 per cent. were killed by parasites and fungus diseases.

Very few parasites of the insects were obtained in Novotorzhok, where most of the caterpillars of the preceding autumn had perished from flacherie and muscardine; this was also the case in 1909. The species recorded are two Ichneumonids, *Anomalon* sp., bred from a pupa of *F. exclamationis*, and *Paniscus gracilipes*, Gr., reared from caterpillars of both species in August; and one species of fly, *Tachina larvarum*, L., reared from caterpillars of *F. exclamationis*.

In the government of Tula most of the caterpillars perished from parasites and only a small proportion from flacherie. The following figures are given: ICHNEUMONIDAE: 12½ per cent. of the caterpillars were infested by *Paniscus gracilipes*, 28¼ per cent. by *Henicospilus merdarius* and *Ambliteles vadatorius*, and 3½ per cent. by *Exetastes agrotidis*, Kok., sp. nov.; TACHINIDAE: 17 per cent. by *Gonia capitata* and *Cnephalia bucephala*, and ¾ per cent. by *Tachina larvarum*; 12 per cent. by fungus diseases. *Exetastes agrotidis* has been identified by Kokujev as a new species, and the author gives a description and figures of the imago, larva and cocoon; the larva develops inside the caterpillar of the host and leaves it for pupation, which takes place in earth. The parasite has two generations during the summer and is found constantly on flowers; it parasitises also the caterpillars of *Chloridea dipsacea*, L.

The author mentions also another parasite which he reared from a caterpillar of *F. exclamationis* in the government of Saratov; this being a Braconid, *Amicroplus* (*Macrocentrus*) *collaris*, sp. n., 50–60 larvae of which breed inside one caterpillar of the host; the larvae pupate in the earth; these parasites appeared on the 31st May. Pospielov reports them also from the government of Kiev.

KULAGIN (N. M.). **Вредныя насѣкомыя и мѣры борьбы съ ними.** [Injurious insects and methods of fighting them.]—Second revised and considerably enlarged edition. *Moscow*, 1913, 783 pp.

Those who have to deal with Russian Economic Entomology will be grateful to the author for providing a mass of detailed and well arranged information on the subject and an excellent guide to the insect pests of crops over a vast extent of country, embracing wide variations of climate and local conditions, and in which the unit of area of individual crops is more easily reckoned by square miles than by acres, while the damage done by certain pests in a single season would be equivalent to the virtual wiping out of that crop in several English counties. A series of lectures, delivered by the author at the Moscow Agricultural Institute, form the basis of the book and in accordance with the programme of these lectures the author has more or less confined his attention to the pests of field crops, orchards and gardens, dealing only with the more important forest pests. In this, the second edition, the number of insects dealt with has been very greatly increased and the information regarding each enlarged, and brought up to date. As the book deals with the subject from the Russian point of view and is intended for Russians, the author has chiefly relied on Russian entomological literature, local conditions being, as he insists, the principal factor to be considered in fighting an insect pest. A number of remedies are dealt with, the real efficaciousness of which is still not proven, but which may nevertheless ultimately be of value. The author has advisedly made use of the best known scientific names, despite the fact that many of these are no longer held to be correct, on the ground that by so doing he has avoided the confusion which would inevitably have arisen had he endeavoured to incorporate the recent frequent and rapid changes in nomenclature.

The subject matter is arranged under the insects in their systematic order, descriptions being given of the various groups, families and genera, while the individual species are dealt with most comprehensively. The last part of the book is devoted to a general review of the scientific methods of fighting insect pests. Chief amongst the latter the author puts the organisation of Entomological Stations, and he quotes from the report of a special committee, which, under his chairmanship, investigated the question of the objects and duties of such Stations, and reported thereon to the Moscow Zemstvo in 1912. The authors of this report dwell upon the intimate dependence of various pests upon the geographical position of a locality, its meterological conditions, and the methods of agricultural economy and field cultivation prevailing therein; it is also pointed out that these conditions may be very different even in closely adjoining areas, so that an exhaustive study of these factors is necessary, and the results obtained in the laboratory must be checked by observations under natural conditions. The Stations must also educate the population by means of lectures and popular pamphlets, and by sending collections of insects to elementary schools, agricultural societies, etc.; they should further warn the public as to the possibility of an outbreak of various pests. Among other scientific methods of fighting injurious insects are mentioned crop rotation and the cultivation of the soil at

times and in a manner best suited for this purpose. The value of preventive methods is also insisted upon, such as precautions when buying seeds and seedlings, careful attention to the bark of trees in orchards and gardens underneath which many insects pass their winter, etc., and assistance on the part of man to different enemies of insects, such as birds, parasites, fungus diseases, etc. The author deals at some length with the question of the useful services rendered by birds in destroying insects and quotes a report on some investigations of Pomeranzev and Shevirëv, from which it appears that in the stomachs of various birds are found mostly insects of the order Coleoptera, next in order being Hemiptera, Hymenoptera (ants), Orthoptera, Diptera and Lepidoptera; Neuroptera are seldom found. The author further discusses the work done on this subject by Baron von Berlepsch in Germany and suggests the necessity of regulations calculated to protect useful birds. In his opinion birds are not able to control an insect pest after it has become abnormally abundant, as their capacity for destruction is limited, but they may sometimes prevent such outbreaks. The protection of birds can be accomplished by means of special regulations as to shooting and trapping, by the control of industries connected with the preparation of birds' skins, and by educating the public in this direction.

The indices are particularly useful and consist of an index of generic names, an index of Russian popular names (450) and a general index with special reference to insecticides. When it is considered that no less than 278 insect pests are dealt with and that the information given in each case is practically exhaustive from the author's standpoint, it is a matter for regret that the language in which it is written prevents a most useful and practical book from being generally accessible to Economic Entomologists throughout the world.

SHEVIRËV (I. J.). **Регулированіе пола потомства самнами наѣздниковъ.** [The Regulation of the Sex of their Offspring by Female Ichneumonidae.] *Bulletin du Laboratoire Biologique de St. Petersbourg*, iii, no. 2. 1913, pp. 24-30.

The author records the observations made by him in the Entomological Laboratory of the Forestry Department on parasitic insects hatched from pupae: these had first been conducted on *Pimpla instigator*, F., but were repeated and confirmed also on *Pimpla examinator* F., *P. brassicariae*, Poda, and *P. capulifera*, Kriech. Each *Pimpla* was kept in a special cage, made of cardboard and muslin and fed every alternate day, the food consisting of a smear of honey on a glass with a drop of water; some insects were fecundated, others were kept virgin during their whole life, which lasted from two to three months. The author has noticed that all these species of *Pimpla* belong to a group called by him "uninuptae," i.e. they are fecundated only once in their life, refusing afterwards to copulate with any other male. The opposite group, "multinuptae," for instance *Theronia*, consists of species, which are fecundated repeatedly and by many males. The fecundated, as well as the unfecundated females oviposited willingly on pupae which had been placed in an artificial cocoon, made from muslin or linen. Some of the pupae offered for oviposition were of large size, such as those of *Sphinx*, *Saturnia*, *Gastropacha pini*,

Smerinthus populi, etc., while other were small, such as *Pieris*, *Bupalus*, *Pamolis*, *Vanessa levana*, etc. The author gives a few instances of his observations on fecundated females from which he concludes that, in depositing their eggs in various pupae, the females regulate, in the great majority of cases, the sex of their descendants, according to the size of the pupae. In large pupae, containing a plentiful supply of food, are deposited eggs from which females hatch out, while small pupae contain only male eggs. If only large pupae are offered, males can be quite excluded from the descendants of a given female, and when only small pupae were supplied the percentage of hatched males was greater than that of the females. These observations have been confirmed with pupae infested by parasites under natural conditions. The author had about 2000 cocoons of *Lophyrus*, the cocoons of the females of which are nearly twice as large as those of the males. He kept the cocoons of the males and of the females separately and obtained parasites from 970 cocoons; the parasites belonged to two species:—(1) *Exenterus* sp., of which 870 were bred; from the large cocoons 21 per cent. were males and 79 per cent. females, and from the small cocoons 53 per cent. were males and 47 per cent. females; (2) *Campoplex* sp., of which 100 were obtained, 30 per cent males and 70 per cent. females out of the large cocoons, and 74 per cent. males and 26 per cent. females out of the small cocoons.

As to virgin females, his observations have confirmed previous statements that such females are able to lay eggs and to produce descendants, the latter being only males, and he is of opinion that this rule applies to the whole family of ICHNEUMONIDAE in its wide sense. The size of the males produced varied in accordance with the size of the pupae in which they developed. Giant males were obtained from the large pupae of *Sphinx ligustri*, dwarfs from the small pupae of *Bupalus piniarius*, and males of medium size from the pupae of *Pieris brassicae*.

BORDAGE (E.). **Notes Biologiques recueillies à l'Ile de la Réunion.** [Biological Notes from Réunion.]—*Bull. Scient. de la France et de la Belgique, Paris*, xlvii, no. 4, 5th Jan. 1914, pp. 377-412, 14 figs.

The author has given an account of some of the more interesting features in the life-history and habits of certain insects found on Réunion; many cases mentioned are of economic interest. In the Mascarene Islands sugar-cane is attacked by various Lepidoptera—*Diatraea striatalis*, Snell., *Sesamia inferens*, Walk. (*albiciliata*, Snell.), *Grapholitha schistaceana*, Snell., etc.—which bore into the stem of the plants. Their principal enemies are three Ichneumonids: *Ophion mauritii*, *O. antankarus* and *Paniscus melanocotis*, which also occur in Madagascar and Mauritius, where they are of great service to sugar-planters. Referring to the introduction of *Sirex gigas* into Réunion, the author draws attention to the great strength of the mandibles of this insect; he believes it to have been transported from Europe in wood into which it had eaten its way: *Sirex gigas* has been known to gnaw through a pile of cardboard, and even through the lead of cartridges. Further cases of parasitism on insects harmful to cultivated plants are recorded; in Réunion the coffee plants have their leaves mined by two micro-

lepidopterous insects, *Leucoptera* (*Cemiostoma*) *coffeella** and *Gracilaria coffeifoliella*, both of which are attacked by a Chalcid (*Eulophus borbonicus*, Gd.) and a Braconid (*Apanteles bordagei*, Gd.); *L. coffeella* is kept well in check by these parasites in Réunion, whereas in the Antilles serious damage is done by this moth. Three species of ACRIDIIDAE are found in Réunion. *Locusta migratoria*, *Acridium septemfasciatum* and *A. rubellum*, and in certain years these insects have caused serious damage to sugar-canes. An attempt was made to combat *A. septemfasciatum*, which was particularly prevalent in 1901, by introducing the fungus disease due to *Mucor exitiosus*, Mass. In the laboratory the result was very satisfactory, as it was there possible to maintain the temperature and moisture conditions most favourable to the propagation of the fungus: but in the field the same success was not met with, possibly owing to the coldness and dryness of the season. In 1765 Poivre introduced the mynah of the Philippines (*Acridotheres tristis*, Vieill.) into Réunion: this bird which used to prey upon crickets and grasshoppers is now of little use in controlling these insects, as it has become practically frugivorous in habit.

The Coccid *Orthezia insignis* is plentiful in Réunion. At first it was recorded as feeding mainly upon the noxious plant *Lantana camara* (Corbeille d'or), thereby being beneficial; but lately it has taken to feeding on cultivated plants and must be regarded as a pest. An account of this insect in other parts of the world and its food-plants is given. Giard suggested that the waxy secretion deposited by this insect might be utilised in the making of wax candles, as it is used in China for the preparation of pe-la wax. Another Coccid pest is *Ceroplastes vinsoni* which attacks the tea plant, mango trees, guavas, bibassier (*Eriobotrya japonica*), *Agauria pyrifolia*, *Quivisia heterophylla*, and *Aphloia theaeformis*.

Two scale-insects are harmful to the coffee plant, namely *Saissetia coffeae* and *S. nigra*, and also *Pseudococcus adonidum*, which attacks not only the young shoots, but also the roots; this species is devoured by a Coccinellid, *Scymnus rotundatus*, Motsch. Cocoa trees are attacked by the Coccid *Aspidiotus destructor*, Sign.: although no steps are taken to combat this insect, it remains well under control, probably owing to the fact that it is parasitised by certain Chalcids. Vanilla plantations are attacked by *Cerataphis lataniae*, Licht. A species of Psyllid (*Trioza litseae*, Gd.) has been found on plants of the laurel family, and also on Orchids whose fruit it destroys; it is possible that at any time it may attack the vanilla; to avoid this possibility the author suggests cutting down the laurels that at present form its staple food.

CAESAR (L.). **The San José and Oyster-Shell Scales.**—*Ontario Dept. Agric., Toronto, Ont., Bull.* 219, Jan. 1914, 30 pp., 16 figs.

The original home of the San José scale is China. It was introduced into San José, California, about 1870. By 1893 or 1894 it had spread all over most of the United States and had even been brought into Ontario. It was doubtless brought in on nursery stock, and the insect can live and thrive at least wherever peach trees can be grown,

* See this *Review*, Ser. A, i, p. 105, note.

and therefore may be expected to spread through all peach districts, but probably not further north than its present northern limit. All orchard trees, except sour cherries and usually Kieffer pears, are attacked. Currants, rose bushes, some ornamental and forest trees and shrubs are also severely affected. The insect may be easily identified, since it usually causes small, circular reddish spots on the fruit and a purplish discoloration of the tissues beneath the bark where it feeds. The adult female is almost circular, nearly flat, about $\frac{1}{8}$-inch in diameter, grayish to ashy brown in colour, with usually a small yellowish area in the centre. The immature black stage is found at all seasons. The first brood of young scales begins to appear about 20th June and there are probably three, or nearly three, full broods a year in Ontario. A single over-wintering female may produce 1,000,000 offspring. By far the most important of all the various means of distribution of the San José scale has been infested nursery stock. Once in a locality, it spreads from tree to tree by the active larvae crawling upon various kinds of insects or birds that alight upon or frequent infested trees. Winds and vehicles may also assist in their distribution. There is apparently little danger of establishing the pest in a new centre by marketing infested apples, but as a precaution the sale of such fruit is forbidden by law. The scale will attack any part of the tree or plant above ground and the bark may become thickly encrusted with it. The insects suck the juice of the plant and probably also secrete a poison which increases the injury. Small trees may be killed in a couple of years; larger trees usually take longer, and an old apple tree may survive for six years or more. Infested fruit is usually dwarfed. Among the natural enemies of this insect in Ontario are *Microweisea (Pentilia) misella*, *Chilocorus bivulnerus*, *Aphelinus mytilaspidis* and *A. fuscipennis*, a red mite and a fungus disease; but they are of little importance in controlling the pest. The insect can be readily controlled by a single thorough spraying once a year, before the buds have burst in spring; badly infested trees require two applications the first year, one in autumn, the other in spring. The spraying must be done thoroughly so that every part of the tree above the ground is covered. The lime-sulphur wash is to-day recognised all over North America as much the safest, best and cheapest spray mixture. The most desirable strength is about 1·035 specific gravity. As a supplement to lime-sulphur spraying, kerosene or crude petroleum emulsion may be used. Spraying should not be done when the trees are wet, nor when it is likely to rain. Neither should it be done when the temperature is below freezing point. The lime-sulphur should always be tested with a hydrometer. It is usually possible to control the scale in one's own orchard independently of neighbours.

The oyster-shell scale (*Lepidosaphes ulmi*, L.), believed to be an imported insect, attacks apples chiefly, and also pears, plums, cherries, gooseberries, currants and ornamental plants. This scale confines itself almost entirely to the trunk and branches. The injury is due to the plant juices being sucked out by the insects. In thrifty orchards the insect is seldom abundant, since it seems to exhibit a preference for neglected and weakened trees. Attacked trees usually live for many years. The female scale is about one-eighth of an inch long and scarcely one-third of this in width, this shape

distinguishing it from the San José scale. The oyster-shell scale passes the winter in the egg stage, the eggs hatching about 1st June. There is only one brood a year in Ontario. The chief means of distribution of this insect is the shipment of infested nursery stock, as well as the carrying of the larvae by birds and other animals. Among the natural enemies of this pest are lady-bird beetles (adults and larvae), a few mites and a fungus disease. The lime-sulphur wash, properly applied, will readily control this scale. Two sprayings should be given for the best results, the first at the strength of 1·030 and the second at 1·009 specific gravity. The spray not only destroys the oyster-shell scale, but many other insects. Bordeaux mixture may be used in place of the lime-sulphur, just before the blossoms burst. Old trees should be pruned before spraying and the rough bark scraped off.

GOUGH (L. H.) & STOREY (G.). **Methods for the Destruction of the Pink Boll Worm in Cotton Seed.**—*Ministry Agric., Egypt, Cairo*, 1914, 21 pp.

The history of the pink boll worm in Egypt has been a short, but disastrous one. The moth (*Gelechia gossypiella*, Saund.) was introduced from abroad not many years ago. The first specimens recorded by the Entomological Section were bred on 29th November 1911, and in 1913 *Gelechia* larvae caused more damage than all the other cotton pests put together. In 1912 experiments to destroy the caterpillars by fumigation were all carried out on seeds in sacks, but the method was recognised as very imperfect. In 1913 other experiments were made and the methods may be classed into mechanical and chemical. The mechanical methods included hot water treatment, cold air treatment, hot air treatment, and enclosure in a vacuum. In the experiments on the first method, small equal quantities of seeds were tied up in muslin bags and immersed in beakers of hot water for one minute the temperature being recorded by a thermometer in the water and another with its bulb within the seeds. From experiments it is shown that the fatal temperature for *Gelechia* larvae must lie very close to 50° C., while the fatal temperature for cotton seed is very near 75°. This is not a suitable method for employment on a large scale on account of the necessity for the immediate sowing or immediate drying of the tested seed. An experiment was made with temperatures under 0°, and -6° C. was found to have no effect on the larvae. Experiments on the effect of temperatures over 60° C. gave positive results. In the first series a hot water bath was constructed and traversed from end to end by a square tunnel which sloped gently upwards. Two rollers outside the ends of the tunnel carried an endless band of cloth, on which the seeds to be tested were placed and then carried through the tunnel. It was found that exposure to a temperature between 75° and 94° killed all the larvae without affecting germination. The results might possibly have been different if the seed had been resting on metal instead of cloth, and caution is urged if this method of hot air treatment is used. In a second series of experiments, the seed was lying on a sheet of asbestos, and here four minutes at 80° appear to have been perfectly effective in killing the caterpillars without unduly affecting the seed. Any hot-air machine must be tested. To test the possibility of killing *Gelechia* larvae by subjecting

them to reduced pressure some of the insects were introduced into the vacuum at the top of a mercury barometer, but half an hour under these conditions had no effect.

The chemical methods tried were chiefly based on the poisonous effects of various gases. Carbon bisulphide vaporised at the rate of 1 c.c. of the fluid to each litre of the seed gave perfect results at the end of half an hour. Three methods were used, the fluid carbon bisulphide being sprayed on the cotton seed whilst passing into the container; the carbon bisulphide introduced into the container before filling with seed; and the carbon bisulphide vapour circulated through an evaporating chamber into the container through an air-pump and back through the evaporating chamber to the container. The last method is the best, but the last two both gave perfect results. A machine to utilise the last method could be constructed on the following general lines:—Five or six vats to contain the seeds to be treated form the "battery." These vats must be constructed so that they can be hermetically closed when charged. Arrangements must be made to pump the gases in below, and a diffuser would be required at the top to draw off the gases. The circulating system would consist of an exhaust main and a blast main connected by a rotary or turbine air-pump. From these mains, branches would be given off to each of the vats. This would enable a constant current of air or gas to be run through any or all of the vats, since each branch would be arranged so that it could be cut off from the main by a tap. In practice one vat would be filling with seed, the following filling with gas, the next two would be standing to let the gas act, the fifth would be discharging gas and the sixth discharging seed. By this method the charges of carbon bisulphide required when the machine is going will be considerably reduced, and the advantage of having two vats "standing" full of gas is that the period of action for the gas is thereby doubled. Carbon bisulphide vapour has no effect on the germination of cotton seed. As the time proposed for action of the gas is not more than one hour, no fear need be entertained of deterioration of the seed. Motor spirit was tried and although used in larger quantities was less effective than carbon bisulphide. Ammonia was unsatisfactory, especially as germination appeared to suffer. Hydrocyanic acid gas, even in very small doses, kills a very high percentage of larvae, but requires a longer time to act than carbon bisulphide. The expense for chemicals however, would be less. The use of sulphur dioxide produced by a "Clayton machine" gave distinctly promising results, but they cannot be compared with the results of other experiments, owing to the impossibility of using the machine for small scale trials. Tobacco smoke and vaporised Cyllin were ineffective, although Cyllin in solutions of 1 : 1,000 were all that could be desired, if the seed containing the larvae were soaked for a period of twenty-four hours. "Salvarsan" in dilution of 1 : 1,000 was effective in killing the caterpillars, but affected germination also. It has been found that no treatment is possible when the seed is in sacks, and in order that such treatments as are mentioned above may be effective, rigorous measures should be adopted to destroy all cotton bolls left on the cotton sticks after the last picking.

Vassiliev (I. V.). **Шелкопряды сосновый и кедровый, ихъ образъ жизни, вредная дѣятельность и способы борьбы съ ними.** [*Dendrolimus pini*, L., and *Dendrolimus segregatus*, Butl., their life-history, injurious activities and methods of fighting them.] **Труды Бюро по Энтомологіи Ученаго Комитета Главнаго Управленія З. и З.** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture*,] *St. Petersburg*, v, no. 7, 1913, 99 pp., 34 figs., 2 col. plates. (Second, enlarged edition).

This is an enlarged edition of the author's report on *Dendrolimus pini* and *D. segregatus*, after investigating in 1898 and 1899 the devastation caused by the latter in the forests of the government of Irkutsk (Siberia). After describing fully all the stages of these two moths, the author proceeds to deal with the life-history of *D. pini*. Hot dry weather accelerates the development of the earlier stages and the appearance of the imago, while a cold, wet summer has an opposite effect. In most parts of Russia the moths start flying from the end of June to the beginning of July, and attain their maximum during the middle of July. A full account is given of the oviposition, development, hibernation, pupation, etc., of both *D. pini* and *D. segregatus*. The flying of the latter species in the forests of the southern part of the government of Irkutsk took place in 1899 at the end of June and the beginning of July, and after the 27th July no live moths were to be found, the earth everywhere in the forests being covered by their dead bodies. These insects were specially abundant in woods consisting of *Pinus cembra* and in the "taiga,"* while they were totally absent in pure birch-woods and in mixed woods of pine, larch and birch trees; in pure pine woods they were found only where the latter joined the affected areas. In 1898 there were very few moths in the forests of the government and the author did not find any of their eggs, but there were plenty of caterpillars; this fact led him to assume that the development of the insect takes two years, that the year 1898 was not a "flying" year, and that the year 1899 would witness an outbreak of the moths and extensive oviposition. This assumption proved quite correct and early in July 1899 there was scarcely a small plant which did not bear eggs of *D. segregatus*. The trees most affected were *Pinus cembra*, the silver fir (*Abies pectinata*) and the spruce (*Picea excelsa*); less frequently the eggs were found on needles of pines and larches, while in exceptional cases only were they found on leaves of birch, aspen, service trees, spiraea, red and black bilberry and various grasses. It was observed that the insects did not oviposit on plants affording a limited supply of food; eggs were seldom found on freshly stripped or withered plants, in which respect this species differs from *D. pini*, the females of which oviposit indiscriminately on plants in any state. Most of the eggs were laid on the needles and only in a few exceptional cases were they found on the branches or trunks. The total number of eggs deposited by one female is on the average about 200, the maximum number being 315. The hatching of the caterpillars proceeded from the middle of July till the middle

* ["Taiga" is a Siberian word signifying a dense, more or less impenetrable forest, often of a swampy character.—Ed.]

of August, and most of them hibernated before the second moult, as the temperature of the nights and early mornings fell sometimes to freezing point even in the first half of August. The caterpillars appeared again on the trees in the first half of the next May, but just after their appearance they take little food. The feeding increases gradually, and the maximum damage to the trees takes place in June and July, when a caterpillar may devour in a few minutes a whole fir needle; during this time the caterpillars more than double their size. In August the feeding decreases again, although the caterpillars still remain on the trees, passing to the second wintering in September. Hibernation takes place in both cases under moss in the "taiga." After the second winter the larvae appear again in April, feeding till early in June, when they pupate, producing moths in the same month.

The author goes on to deal with the importance of *D. pini* in the economy of forests, describing the nature and consequences of the damage done, the selection of plantations by the females for oviposition, the methods of migration of the caterpillars, and the geographical distribution of the pests. It often happens that numbers of the larvae perish through not being able to find food in the woods laid bare by the preceding generations; moreover, the denudation of the crowns of the trees also caused the pupae to perish, owing to the excessive heat of the sun's rays, coupled with the loss of moisture. The bare crowns favour also the activities of various parasites, and the number of caterpillars infested by them in such trees is much larger than in trees with needles on them. While *D. pini* prefers pine trees, which provide its principal food, *D. segregatus* avoids these trees, and the author states that he has even seen single pines or groups of pines unattacked or only slightly damaged, while all the trees round them (firs, cedars, larches) were entirely stripped by the larvae. In the government of Irkutsk the principal food of these insects is provided by firs, Siberian firs and cedars, while in some parts of the government of Ufa *D. segregatus* damages principally larch trees. The caterpillars attack mostly old cedar woods or "taiga" forests (100–150 years old) which form the greater part of the forests of Irkutsk; young plantations, up to 10 years are seldom attacked, unless they are situated in the neighbourhood of an infected area; otherwise they are only attacked after the older trees are laid bare. While it is admitted that the young larvae of *D. segregatus* may possibly be distributed by the wind, the older caterpillars are able to migrate only for short distances. The geographical distribution of *D. segregatus* includes the whole of North Asia, from the Ural Mountains to Japan, the north-western limit of its distribution being Syrostan, in the Southern Ural. The author gives a short history of the devastation caused by this pest since 1892, when attention was first drawn to the enormous damage caused by it in the "taiga" of Eastern Siberia; the local population had known the larvae for 15–20 years previously. Most of the attack was concentrated in two districts of the government of Irkutsk and it is calculated that the damage there amounted to more than £55,000, several hundred thousand dessiatines (2·7 acres) of forests being destroyed or injured. In these districts may be seen enormous areas of dead and dying forests of cedars, firs and larches. Young trees, of up to 20–30 years, die in the same year: the older cedars and firs, when damaged by *D. segregatus*, are usually subjected afterwards to attacks

of such beetles as *Monochamus sartor*, *M. pistor*, *M. sutor-arius*, *Ips typographus* (firs) and *I. sexdentatus* (cedars). To this must be added the injury caused by the decrease in the fir and cut trades of the locality, which resulted from the drying out of the "taiga." In 1902–3 an outbreak of *D. segregatus* occurred on the European side of the Southern Ural, in the district of Zlatoust of the government of Ufa and in the adjoining district of Troitzk of the government of Orenburg, where some hundred dessiatines of deciduous trees were devastated.

With regard to the natural enemies of *D. pini*, the author says that amongst mammals the most important are bats. Among birds, various titmice and tree-creepers eat the eggs; the caterpillars are principally devoured by cuckoos, as well as by crows, rooks, magpies, jackdaws, great spotted woodpeckers and rollers. The large caterpillars and moths are also destroyed by the grey-backed shrike (*Lanius excubitor*), which impales them on the needles of young pines. The pupae of *D. pini* are eaten by *Parus ater* and *P. cristatus*, also by crows, jackdaws and rollers. The moths are principally attacked by owls, goatsuckers and the red-footed kestrel (*Erythropus vespertinus*). But the most important enemies are insects, amongst which the following predators are mentioned: predaceous beetles and their larvae (chiefly CARABIDAE), ants, Pentatomid bugs and Asilid flies. The caterpillars and pupae of *D. pini* are subject also to fungus diseases, and especially those caterpillars which winter in wet soil; chief amongst the fungi the author puts *Cordiceps militaris*, but there are also cases reported of diseases caused by *Empusa* and *Botrytis*. The bacterial diseases have not been fully studied, but the author is of opinion that flacherie probably exists.

Considerable space is devoted to parasites of *D. pini*, and a list is given containing 13 species of Diptera, *Tachina winnertzi*, B.B., being recorded for the first time; there is also a list of parasites of the families ICHNEUMONIDAE, BRACONIDAE, CHALCIDIDAE and PROCTOTRUPIDAE (p. 55). The author remarks that this list cannot be considered to be final, and it is probable that some of the parasites may prove to be hyperparasites, as has already been proved by him in the case of *Theronia flavicans* and *Monodontomerus virens*, while others, such as *Ischnocerus marchicus* and *Rhogas esenbeckii*, may have to be excluded. The egg parasites *Ooencyrtus atomon* and *Telenomus umbripennis* were first found by him in 1904. The author deals separately with each parasite, and gives in every case a list of their other hosts. He mentions that the Tachinid fly, Phryxe (*Blepharidea*) *vulgaris*, Fall. is ovi-viviparous, a female laying up to 5,000 larvae, each included in a transparent cover, which sticks to the skin of the caterpillar; *Sarcophaga albiceps*, Mg., and *S. affinis*, Fall., are both viviparous and monophagous. With regard to *Trichogramma* (*Oophthora*) *semblidis*, Aur., the author is satisfied, by his latest experiments in 1912–13, that this species is not synonymous with *T. carpocapsae*, Ashm., and he points out the difference in the habitat of the two species, remarking also that *T. carpocapsae* does not infest the eggs of *D. pini*, breeding in nature principally in the eggs of *Cydia pomonella*, and also in those of *Phlyctaenodes sticticalis* and *Euproctis chrysorrhoea*. His experiments and observations have satisfied him that *Telenomus phalaenarum*, Nees, never infests the eggs of *D. pini*.

With regard to the enemies of *Dendrolimus segregatus* in the government of Irkutsk, they consist principally of certain birds and parasitic insects. The large caterpillars are devoured by a jay (*Garrulus infaustus*), while the smaller caterpillars and the eggs are destroyed by *Sitta uralensis* and *Poecile baicalensis* and similar species; both these birds, in company with woodpeckers and the nut-cracker (*Nucifraga caryocatactes*), destroy also the pupae. The most active parasites, according to his observations in 1899, were: *Panzeria rudis*, Fall., and *Masicera cespitum*, Macq., which destroyed in the Shadarinsk "taiga" more than 30 per cent. of the caterpillars; while the egg-parasite, *Telenomus gracilis*, Mayr, also proved very useful, more than [illegible] of the eggs collected by the author being infested; in the young caterpillars he found parasites of the genus *Rhogas*. Besides parasites and birds, the insects perished also in great numbers from a bacterial disease, which the author is inclined to recognise as flacherie. As preventive remedies the author suggests mixed plantations, consisting of deciduous and coniferous trees, oak, birch, beech and aspen being recommended as suitable. Small woods, of trees of various ages, even when consisting only of pines, are also less damaged by the insects and can be better supervised; care must also be taken to cultivate strong healthy trees, which will be able to withstand the damage. With regard to destructive remedies he recommends bait-belts of tanglefoot; isolation avenues, to divide the attacked parts of the wood from the rest; poisoning of the caterpillars by means of Schweinfurt green, in a proportion of about 2 lb. of green and 4 lb. of freshly slacked lime in about 110 gallons of water. The handpicking of wintering caterpillars has proved to have very little effect. The destruction of the eggs of *D. pini* can be recommended only as a secondary remedy, and is only admissible when there are no signs of the eggs being infested by parasites. The eggs can best be destroyed by crushing or smearing them over with naphtha or by handpicking and this must be done quickly at the time when the flying of the moths is nearing its end. The collection by hand of the moths, which usually sit motionless during the day, not very high above the earth, is also recommended, especially before oviposition has started; the collection of the pupae is only recommended when the percentage of pupae infected by parasites is small.

With regard to *Dendrolimus segregatus*, such remedies as bait-belts do not appear practicable in the forests of Siberia. But the fighting of the pest by means of its parasites may prove very successful, principally the parasites of the eggs, such as *Telenomus gracilis* and *T. umbripennis*. These must be artificially bred and supplied to localities threatened by *D. segregatus*.

Deyez (G.). **La Fourmi-Manioc** (*Oecodoma cephalotes*). —*L'Agronomie Coloniale, Paris*, i. no. 5., Nov. 1913, pp. 129-135; i, no. 6, 31st Dec. 1913, pp. 164-174; i, no. 7, 31st Jan. 1914, pp. 13-18; i. no. 8, 28th Feb. 1914, pp. 42-51, 1 pl.

Opening with a few paragraphs on the general agricultural conditions in French Guiana, the author draws attention to the fact that many people have given up agricultural work, and this he believes to be due to the many discouragements met with in agriculture; for example,

in one night the most beautiful field, garden or fruit trees may be devastated by a band of leaf-cutting ants, known in the colony under the name of "fourmi-manioc," the greatest enemy to agriculture in Guiana. When on an expedition the ants form two groups: one group climbs the tree and bites off the whole leaf or parts of it, while the other group waits at the foot of the tree and gathers the leaves, which they carry to the nest. Numerous remedies have been tried against these insects without much success, such as the introduction into their nests of boiling oil, chloroform, corrosive sublimate, etc., and the Clayton system of forcing sulphurous fumes into the nest has not proved effective. Carbon bisulphide however has given excellent results, but apart from its dangerous qualities, it has the drawback of being expensive, as large quantities have to be used.

As a result of his experiments the author was led to believe that sulphurous anhydride would be still more useful. This substance when liquified possesses a considerable force of expansion, which, together with its great density, ought to allow it to penetrate to the deepest galleries. It is also very soluble in water and diffusible, and is not poisonous in small quantities, since the State authorises its use in wine-making to the extent of 350 milligrams per litre. The air cannot be breathed when it contains 1·5 per cent. of this gas. Pure liquefied sulphurous anhydride is prepared by two companies in Paris—La Compagnie Raoul Pictet, and Le Laboratoire des Industries Alimentaires. In Guiana this substance may be obtained for 0·85 francs (about 8d.) per kilo. (2·2 lb.), and is sent in copper or steel drums containing 25, 50 or 100 kilos. These drums are stamped at 30 atmospheres and have a tap. This tap is prolonged to the interior so as to receive a bent tube forming a siphon, so arranged that according to the position in which the drum is placed the anhydride can be obtained either as a gas or a liquid. Having obtained one of these drums, it is placed near the nest about to be destroyed, and a tube 3 metres long and 1 centimetre in diameter is attached to it, by means of a union. This tube is flexible, being made of bronze and asbestos, and surrounded by a metal twist of bronze to make it stronger. It ends in a stiff copper spike about 75 centimetres long, pierced in the last ten centimetres with about a dozen holes to allow the gas to escape. The outside of the nest is cleared to expose all the openings and it is generally necessary to remove the superficial layer of earth. The spike is then inserted into a hole only when it can be easily thrust in to a depth of 20 to 25 centimetres in any one direction, all the openings being thus treated. The spike should each time be slipped into a hole before opening the tap, the whole process taking about two hours. The necessary time for each hole varies, according to its importance in the nest, from two to five minutes. After the use of sulphurous anhydride it is not at all necessary to dig out the nest, but it should be visited a few days later to see whether any ants are still alive. This method has been employed with perfect success in the destruction of many large nests, and the treatment of a nest 15 metres in circumference and the top about 40 centimetres above the level of the soil was witnessed by a meeting of the Chamber of Agriculture. The next day this nest was dug out and found to consist of seven tiers of nests, the lowest being at a depth of 1·5 metres; all the ants were dead and discoloured, 4 kilos of sulphurous anhydride being used.

This substance has many advantages over carbon bisulphide, since it is not inflammable, can be used at all times of the year, water not being at all necessary, and has no ill effects on neighbouring plants. When done thoroughly, as described, the results are said to be perfect.

HEADLEE (T. J.) & PARKER (J. B.). **The Hessian Fly.**—*Kansas State Agric. Expt. Stn., Manhattan, Bull.* 188, July 1913, pp. 87-138, 15 figs. [Recd. 28th March 1914.]

The Hessian Fly first appeared in Long Island in 1779 and has spread north, south and west, causing serious loss in most of the wheat-growing regions of the United States. Since its first appearance in Kansas the fly has alternately disappeared and reappeared, since unfavourable weather conditions or an undue abundance of natural enemies may almost eradicate it. The egg is deposited upon the upper surface of the leaf, generally on wheat, rye, and barley, though recent evidence shows that certain wild grasses, as *Agropyron smithii*, serve as well. The length of the egg stage varies from two to ten or more days. An individual bred in an insectary, in an average temperature of 67 F. and an average mean relative humidity of 67·2 per cent. required 60 days to pass through all its transformations, of which 26 days were occupied in the period from hatching to the formation of puparium. The length of the life of the adult fly, a tiny long-legged gnat, is usually limited to a few days. The number of broods in Kansas varies with the climatic conditions. In 1908, the summer of which was very wet, there appear to have been two main broods and three supplemental broods. The main spring brood emerged during March and April; a supplementary spring brood emerged between 7th May and 1st June; a midsummer brood emerged between harvest and wheat sowing on the volunteer wheat; and the main autumn brood of adult flies emerged between 22nd September and 28th October. None of these produced progeny which reached the adult stage before winter. From the 15th to 30th October, a supplemental autumn brood emerged. Normally the midsummer brood might be almost entirely suppressed and no supplemental autumn brood developed. Temperature and moisture probably exert the largest influence on the Hessian fly. The low temperature of winter prolongs the life-cycle of the fly from 30 to 60 days to 6 months. Gossard and Houser showed that eggs after being subjected to a very severe frost in the field are not injured. In a moist atmosphere eggs withstood 107·6°F. easily for three days. Drought is dangerous to the fly and plenty of atmospheric moisture is favourable to it.

Osborn records for America six species of insects parasitic on the Hessian fly, namely, *Merisus destructor*, Say, *Homoporus subapterus*, Riley, *Pteromalus pallipes*, Forbes, *Eupelmus allyni*, French, *Entodon epigonus*, Walk., *Polygnotus hiemalis*, Forbes, and *Platygaster herricki*, Packard. *Tetrastichus productus*, Riley, and *T. carinatus*, Forbes, are parasites attacking the primary parasites of the fly. A new species of *Sciara* and a wire-worm were found to be predaceous enemies of the Hessian fly.

The autumn broods of maggots attack the wheat plants when they are young and the infested stalks are always stunted and frequently killed, though "tillers" may grow out from below the point of injury.

The spring broods of maggots attack the plants when much larger and better able to withstand injury. The attack of the fly may so weaken the stem that it will break at the point of injury and fall over before harvest.

Among measures of control often advocated is the pasturing of wheat, but this has been proved totally insufficient to control the fly. Rolling or brushing is also of little value and mowing does not seem promising in Kansas. No strain of wheat is yet known to be "fly-proof." Garman's work in Kentucky shows that regular treatment of infested wheat with kerosene emulsion, Bordeaux mixture, lime and Paris green, and lime are of little value, while intermittent wheat culture and trap planting seem as useless. Destruction of fly in infested stubble is no doubt one of the best means of combating the pest, and may be accomplished by burning and ploughing under. Burning the stubble will destroy many of the puparia, but will not kill enough to keep the insect under control, those underground remaining untouched. The reason for ploughing lies in the idea that the infested stubble can be so deeply turned under and the ground so firmly packed that the flies emerging from the buried puparia will perish before reaching the surface of the soil. As a result of experiments it seems that where the ploughed stubble is buried beneath four or more inches of well pulverised soil, none of the flies can escape. Volunteer wheat is a menace to the succeeding crop and should not be allowed to grow. Late sowing is one of the most, if not the most, efficient of all measures for fly control. In different territories the date for safe sowing varies and should be ascertained by the entomologist, who should adopt as the safe-sowing date the average of dates on which the sowings of several years have been found absolutely free from fly. When an outbreak is anticipated a close watch should be kept on the fly emergence. The following steps are recommended when wheat is to be sown on a field infested the previous year. The disk should follow the reaper as quickly as possible, since it causes many of the weed seeds and most of the volunteer wheat to germinate and renders their destruction more certain and tends to bring about early emergence of the fly. The disked ground should be turned with a plough three or four weeks later and all rubbish buried at least four inches below the surface of the soil. If there is too much stubble to allow this the field should be burned over before being ploughed. By the use of harrows and packers the surface layer should be pulverised and packed down into a good seed-bed. The crop should not be sown until the safe-sowing date. Good seed and fertile soil will produce thrifty, rapidly growing plants, which will suffer much less injury from fly.

HEADLEE (T. J.) & McCOLLOCH (J. W.). **The Chinch Bug** (*Blissus leucopterus*, **Say**). *Kansas Agric. Expt. Stn., Manhattan, Bull.* 191, Nov. 1913, pp. 287-353, 7 pls., 11 figs. [Recd. 28th March 1914.]

The chinch bug has damaged Kansas crops to a greater extent than has any other injurious insect, and its history reaches back to before the settlers landed. Where corn and similar grains alone are grown the bug does small damage, because food is scarce in the early summer; and again, if wheat and other small grains alone are grown the harm

...all, for food is scarce in the latter part of the summer. This ... winters in bunch grass (*Andropogon scoparius*, Michx.), big blue ... *A. furcatus*, Muhl.), false redtop (*Triplasis purpurea*, Walt.) and ... bunch-forming grasses. With the advent of warm weather ... chinch bugs begin to emerge and leave their winter quarters for ... and other small grains. Here the young are produced and ... maturity shortly after harvest time. With the failure of food in ... small grain field the bugs migrate into adjacent fields of corn and sorghum. Here the young produced reach maturity in the autumn ... establish winter quarters in the grass. Among the natural checks of the chinch bug, climate is probably the most important, temperature and moisture having been shown to exercise a great influence on the ... The low temperatures of winter diminish the metabolism and lengthen the life of the bug. Specimens have been frozen in ice and ... recovered when released. Subjected to a constant temperature ... F. with a humid atmosphere the chinch bugs perish too quickly ... for reproduction. They thrive in dry seasons, but die in wet ones, ... per cent. relative humidity being considered from experiments to be most favourable at a temperature of 70° F. Wet weather destroys ... bugs directly and indirectly: directly by burying the young and the eggs; indirectly by weakening the bug and rendering it more susceptible to disease and by encouraging the growth of its fungous parasite, *Sporotrichum globuliferum*, Speg. This fungus and *Entomophthora (Empusa) aphidis*, Hoffman, stand pre-eminent among the enemies of the chinch bug. Much work has been done on these fungi, but all the really careful experiments agree with the author's results ... showing that it is not possible by artificial distribution of the fungus to hasten materially the progress of the disease. On the whole these parasitic fungi are well distributed throughout that part of the United States subject to chinch bug outbreaks and cause great epidemics when temperature and moisture become favourable. An average temperature of 75° F. and a moisture close to saturation are most favourable to the activity of *S. globuliferum*. Among animals the chinch bug has few natural enemies. No internal parasite is known to attack it. The lady-birds, *Megilla maculata*, de G., *Coccinella sanguinea*, L., *Hippodamia convergens*, Guér., *H. glacialis*, F., *H. 13-punctata*, L., and two species of *Scymnus*, and *Chrysopa plorabunda*, Fitch, have been recorded as its foes. The flower bug (*Triphleps insidiosus*, Say) and *Milyas cinctus*, F., have been known to destroy the pest. Twice the false chinch bug (*Nysius angustatus*, Uhl.) has been observed feeding on the nymphs in the field; and *Harpalus compar*, Lec., *Euarthrus sodalis*, Lec., and *Anisodactylus harpaloides*, Laf., have been seen feeding on bugs of all ages. A centipede and *Gryllus* sp. feed on adults: the ant, *Solenopsis molesta*, Say, was observed carrying off chinch bug eggs, and *Monomorium minimum* carrying bugs of all sizes. Among birds the chief enemies are the quail, prairie chicken, red-winged blackbird, catbird, brown thrush, meadow-lark, house wren, tree swallow, horned lark and flicker. These are not efficient enemies. In a single year the chinch bug damages crops worth millions of dollars and may greatly reduce the wheat and absolutely destroy the corn and sorghums of the individual farmer. As the result of many tests it has been found that twice during the year the chinch bug may be destroyed while passing from wheat and other small grains into adjacent fields of corn

and sorghum, and when just firmly established in winter quarters. As soon as the harvest is over the stubble should be mowed and burned off so as to leave no food for the insects, and the weeds and grass destroyed by thorough disking. This would compel them to leave the field in search of food, and in this passage they are caught by barriers. Two types of barriers are efficient—the dusty furrow for dry weather, and the coal-tar or oil line for wet weather. The dusty furrow is a shallow ditch between the infested and non-infested fields, made with a plough, lister or trough drag, the sides and bottom of which have been reduced to a fine deep dust. The insects that collect in the furrow are then killed by flaming the sides and bottom of the barrier with a strong gasoline torch, the most efficient torch used being the "Locust Torch." The tar or oil-line barrier is a slender line of tar or oil poured along a smooth surface between the infested and non-infested fields. Prof. S. A. Forbes has found the Standard Oil Company's No. 8 road oil efficient and road oil No. 7 has been found to be a highly satisfactory substitute for the tar. To destroy the bugs that may get across, the infested plants are sprayed with kerosene emulsion, or, better still, with a solution of whale-oil soap or a decoction of "Black Leaf 40." The destruction of chinch bugs in winter quarters by the use of fire has proven, in the author's experience, the cheapest and most practicable method of solving the problem. Fire destroys the bugs directly or leaves them exposed to the weather by destroying their cover. The fire must be handled so as to make it burn close to the crown from which the stubble grows and the type of firing varies with the weather. November and December burnings have given the best results.

Ceratitis hispanica **in Algiers.** *Bull. Off. Gouv. Gén. de l'Algérie, Paris,* xx, no. 1, 1st Jan. 1914, p. 3.

It is stated that in the department of Oran orange trees were much damaged during 1913 by the attacks of *Ceratitis hispanica*, which caused the fruit to drop or to die on the trees. Proprietors were recommended to place bottle-traps on the trees, a practice which was successful against the insect in other parts, and which is unattended by risks of destroying the fruit or rendering it harmful to man or animals.

Contre les punaises de la Vigne. [Combating the vine bug.]—*La V. Agric. et Rurale, Paris,* iii, no. 6, 10th Jan. 1914, p. 167.

To combat the vine bug (*Nysius senecionis*) it is recommended by M. Picard of Montpellier to plant at intervals between the rows a species of false rocket (*Diplotaxis erucoides*), which attracts the insects; these plants are to be watered with boiling water or a corrosive liquid that will kill the insects.

Vignobles et Vins. [Vineyards and Wines.]—*Rev. Vitic., Paris,* xli, 29th Jan. 1914, pp. 131-139.

This commercial review of vine-growing in France during 1913 contains the following notes. In the Department of Aude the caterpillars of *Arctia caja* appeared in large numbers, but were destroyed by

a pathogenic fungus, *Empusa aulicea*, before doing much harm. Numerous pupae of *Polychrosis* and *Clysia* had been found in the winter. The first invasion was not severe, but as many growers had neglected lead arsenate treatment, the second generation of these Microlepidoptera was much larger in July. *Polychrosis* became very abundant and its third generation caused important injury. It is imperative that spraying with lead arsenate be practised against the first generation. *Oenophthira* in large numbers has caused much damage to the vineyards in the districts of Carcassonais, Minervois, and Etang de Marseillette, and the treatment applied formerly must be reverted to, and especially the use of arsenical insecticides. The winter slack season is being taken advantage of in some vineyards in Tunis for applying measures against the white scale, *Pseudococcus vitis*.

Sur l'alimentation de la mésange bleue. [On the food of the blue tit.] *Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux,* xiii, no. 1, Jan. 1914, p. 16.

Some interesting observations were made by M. Richard near Neuchâtel on the feeding habits of blue tits. During October, when the leaves of the reeds had died down and only the long yellow stems with the heads remained standing, a blue tit was observed to fly down upon the reeds and break off the heads with its beak, in order to extract insect larvae, which it would devour. It is suggested that the tits which attack almonds are really in search of the larvae they contain and not eating the almonds themselves.

ENGERBUND ( ). **A propos des nichoirs artificiels.** [Artificial nesting boxes.] *Bull. Soc. d'Etude et de Vulgarisation Zool. Agric., Bordeaux*, xiii, no. 1, Jan. 1914, pp. 16-17.

The author records some interesting facts in connection with the destruction of insect pests by birds, housed in artificial nesting boxes. The birds, which were tits, cleared an apple tree in his garden of woolly aphis; red currant bushes were cleared of sawfly larvae, and kitchen garden plants of Pierids. Vines attacked by *Haltica*, were also visited and the pest practically disappeared.

FEYTAUD (J.). **L'Otiorhynque sillonné** (*Otiorrhynchus sulcatus*) **dans l'île d'Oléron.** [*Otiorrhynchus sulcatus* in the island of Oleron.] *Bull. Soc. d'Etude et de Vulg. Zool. Agric., Bordeaux*, xiii, no. 1, Jan. 1914, pp. 7-14, 2 figs., 1 map.

The island of Oléron is, excepting Corsica, the largest of the French islands. The soil and climate are well adapted to vegetation and a large part of the island is under cultivation, vines being especially abundant. Insect pests have not in the past attracted much attention, as their ravages have not been serious, but at the present time alarm is being felt at the spread of certain species, notably of the weevil, *Otiorrhynchus sulcatus*, F. The appearance of this insect in the island seems to have been observed for the first time about four years ago, between Biroire and Chef-Maillère; since then it has spread outwards in all directions. The adult damages the vines by attacking the shoots and arresting their development; this is the most important injury

done, but, in addition, the larva attacks the roots. Other plants attacked are the peach, raspberry and strawberry. The insect appears at the end of May; the eggs are laid during the summer on the earth; the larva, which is fully developed in the autumn, hibernates until the following spring. The adult cannot fly, and consequently its spread is slow; at present in Oléron the attack is restricted to about 100 acres in the commune of S. Pierre.

DEJOHET (E.). **La lutte contre les Cochenilles des Orangers.** [Orange Scale control.] *Rev. Agric. Vitic. Afr. Nord, Algiers*, iii, no. 98, 24th Jan. 1914, pp. 83-85, 1 fig.

Agriculturists in the Philippeville district, in Algeria, decided to undertake general measures for control of the orange scale, *Chrysomphalus minor*. Three insecticides were tested: Polysulphides of calcium, petroleum-soap, and Cooper's Fluid. During the summer the Syndicat Agricole has sold at 75 centimes per kilog. (about 3½d. per lb.) a petroleum-soap prepared in the following manner: A metal pot is placed in a pan containing water kept at boiling point and acting as a water bath; in the pot 4 lb. of soft soap and 6 lb. of ordinary petroleum are mixed until the soap no longer sticks to the wooden spatula used; the pot is then removed and its contents are quickly stirred for a few minutes until a soft paste is formed which stiffens on cooling. Of this paste 10 lb. is dissolved in 20 gals. of water, and as an average of 2 gals. is required per tree, the cost is about 3½d., or 4½d. including labour. In using Cooper's Fluid 1 quart is diluted to 25 gals. with water, the cost per tree being practically the same as for petroleum-soap. When inspecting the orange groves in the valleys of Zéramna and Saf-Saf in September 1913, a visit was paid at Oued Louach to the plantation most heavily infested by *Chrysomphalus minor*, *Parlatoria zizyphus*, *Coccus hesperidum* and *Pseudococcus citri*. The leaves were completely covered and the fruits nearly so. Trees treated with different insecticides were found in a satisfactory condition generally. The insects were dead on the leaves; but on the fruit, though less numerous, they were nearly all alive. The young shoots were unaffected. Petroleum-soap mixture emulsifies with difficulty and this has caused injury to the plants and fruits; Lorette powder was unsatisfactory; Cooper's Fluid gave good results. At Oued Kasja repeated spraying has checked the increase of the scales; some burns had been caused by the petroleum-soap mixture and the polysulphides of calcium proved of doubtful value. M. François, head of the School of Agriculture, made use of polysulphides specially prepared under his supervision, and these were efficacious. On a large estate at St. Charles three applications of Cooper's Fluid resulted in very few scales being found. At Boufarik the polysulphides were a source of complaint, as having caused burns. The author thinks it chimerical to try to stamp out the orange scale at present in view of its universal occurrence, but it has now been shown that its ravages may be reduced to a minimum. Cultivators must consider it in the same light as vine-growers regard mildew, oidium and black-rot. The three insecticides recommended as a result of the 1913 tests are:—(1) the polysulphides of calcium, a safe product being obtained with 3 parts by weight quicklime, 3 parts sublimed sulphur and 200 parts water;

(2) petroleum-soap, if well emulsified: (3) Cooper's Fluid, at a strength of 1 to 1¼ parts in 100 parts of water. Treatment must be effected at the following times:—One application after fruit-picking, when the young scales are not yet protected by the fourth envelope of their shell; a second application in spring, when vegetation starts; and two others during summer, the last being not later than the middle of September. If infection is slight, the leaves may be caused to fall (the orange scale only fastens on the leaves) by spraying with the following, after fruit picking: Potassium carbonate 2 parts by weight, common salt 3 parts and water 100 parts. It is absolutely necessary that all cultivators should act in unison.

Comte ( ). **Les parasites du blé.** [Parasites of wheat.] *Rev. Agric. Vitic. Afr. Nord, Algiers:* iii, no. 96, 97; 10th-17th Jan. 1914; pp. 31-33, 54-60; 14 figs.

Hylemyia coarctata, the wheat fly, which closely resembles *Musca domestica*, has injured wheat in Tunisia, where the author observed it in 1911 near Béja, Tunis, and Kairouan. Two generations occur annually. The larvae of the first gnaw the inside of the stem, causing the plant to turn yellow, but rarely killing it. They are always found at a depth of 1 to 3 centimetres underground. Pupation takes place in the stem during January and the imagines appear from February to March. The larvae of the second generation burrow in the secondary stems due to tillering; on reaching full development they leave the plant and pupate in the soil. The larvae are never found in the principal stems, which remain vigorous. Thus the past season, which was exceptionally dry, has largely favoured their increase, and tillering being also checked by the lack of moisture, the damage done was noticeable, whereas this is not the case in a moist season. The author has never observed this pest except on various kinds of wheat, though it has been stated that it injures barley and rye. The only advisable means of combat are to obtain by proper cultural methods, the use of manures, and the selection of vigorous seed suited to the soil, such robust plants as are able to withstand the injury and produce remunerative crops. The attack of the first generation is the most dangerous, and may be avoided to a certain degree by late sowing.

Sitotroga cerealella, is prevalent in French North Africa. The moths appear in May, and soon afterwards the females lay their eggs on the milky grains of wheat, barley and oats, wheat being preferred. About 50 to 80 eggs are laid. The young larvae penetrate into the grain, upon which they feed, and at harvesting and threshing time they are carried into the barns. In the early days of July the moths of the second generation appear and proceed to attack the wheat stored in the granaries, where a third and even fourth generation may be produced.

Mayetiola (Cecidomyia) destructor, Say, the Hessian fly, has caused serious damage to barley in Tunisia. In the author's experiments the life-cycle of the first generation took six weeks from the 10th February to the 21st March; the second generation five weeks. In comparatively hot countries like Tunisia development is arrested during the months of July, August, and September. On Tunisian

barley four generations were observed from November 1912 to June 1913. Heat and moisture favour the pest, as they do the plant. Dryness retards development, and the author has kept pupae for a year in dry surroundings and then caused them to transform into adults by placing them in damp air. This proves that pupae left in the stubble after harvesting are able to resist the unfavourable conditions. In Tunisia numerous entomophagous parasites attack *Mayetiola destructor* and six species of Chalcids and two species of Braconids were obtained by breeding. At the time the adults of the first generation appeared in February 1912 hardly 10 per cent. of the pupae were parasitised; of the second generation in March about 30 per cent. were parasitised, and by the end of April the figure was 80 per cent. The author discontinued observation as he believed complete control had been attained. He was therefore surprised to find a certain number of flies in the fields in February 1913. On investigating this, a number of dry-stored pupae from the Saint-Cyprien estate were examined, and it was found that while 80 per cent. had been parasitised, the remainder were still living and transformed into adults when kept in damp air for three weeks. In April and May infested barley was collected and kept dry; the parasites hatched out, but the Cecidomyias remained in a state of arrest. The damage done by this pest amounts to many millions of francs in Algeria and Tunisia. Experiments appear to prove that the more water a cereal contains the more open it is to attack. In hot, dry climates those species which contain the least water will show the most resistance. As yet the ravages in wheat in Tunisia have not reached such a pitch as to permit of picking out the varieties most capable of resistance. Barley is badly attacked, and as the most vigorous plants contain the most water, they are also the most susceptible. In spite of this they have a surplus margin of vigour which compensates to a large degree for the losses caused by the pest. Late sowing is a good preventive when the winter is sufficiently cold to hold back the pest. Where the latter is rare in October, wheat, barley and rye germinate safely if sown late. In hot climates this method has no value. In Tunisia stubble-burning between the 15th July and the 15th September is very efficacious, because the fly is then passing through its larval or nymphal stages in the arrested state, and its parasites have already emerged. Owing to the danger of field and forest fires burning is subject to certain regulations in Tunisia. These regulations also require the destruction of the debris from threshing, as this is liable to contain pupae of *M. destructor*. Alternation of crops would be a very practical and economical method did not the wind aid in diffusing the pest, for the Cecidomyia only spreads slowly. Of curative methods, the author states that rolling is ineffective, because of the elasticity and unevenness of the soil. Insecticides are equally ineffective, because the generations follow without any order. Pasturing sheep on infested fields and mowing the green crop may be considered in rich soils, for the larva would thus be killed before it can reach the neighbourhood of the collar. The more water a cereal contains the more susceptible it is to attack; entomophagous parasites may play an important role in control; stubble-burning destroys the pest and favours its parasite. It should be made compulsory in infested districts. The wheat weevil *Calandra*

granaria, L., attacks other cereals as well as wheat, and even Italian paste (macaroni and the like). The softer varieties of wheat are attacked before the harder ones stored in the same granary. If the temperature remains constant at 59° F. one generation would follow another; but the colder temperatures cause a break in the development. In Tunisia four to six generations occur in a year according to the locality.

LAFFORGUE (G.). **Les pièges alimentaires dans la lutte contre la Cochylis et l'Eudémis.** [The use of bait-traps against *Clysia* and *Polychrosis*.]—*Progrès Agric. Vitic., Montpellier*, xxxi, no. 2, 11th Jan. 1914, pp. 38-43.

Careful and extended experiments have shown that alcoholic fermentation must be present in the bait if the moths are to be attracted. The best bait is a 10 per cent. solution of molasses, to every 22 parts of which 1 part of wine-lees has been added. This latter is only necessary when starting operations, as molasses solution, added to maintain the level of the liquid in the traps, is fermented by the remains of the previous filling. Captures are not influenced by the size and shape of the containers, but fermentation is inconveniently rapid in small sizes, while the quantity of fluid necessary and the evaporation therefrom increase with large ones. A pot of glass, or of earthenware glazed inside, with a depth of $3\frac{1}{8}$ in., lip-diameter of $3\frac{1}{8}$ in., and bottom diameter of 2 in., has proved suitable in practice, and $5\frac{3}{8}$ oz. of liquid will fill it to two-thirds, this being the correct height. Two holes, under the lip and opposite each other, provide for suspension with a piece of iron wire. The pot must be placed slightly above the grapes, and in vineyards where three wires are used it is best placed close to the second wire. As the traps only attract moths in their vicinity their number must not be less than 80 per acre. Distribution must not be uniform, as the moths especially abound near buildings, hedges, clumps of trees, paths and the parts of rows most protected from prevalent winds. In such positions the traps must be closer than elsewhere; nor should they be stinted if a severe attack of the pests is anticipated. In 1911, 100 moths daily were taken from those examined on the 14th, 15th, 17th, 18th, 20th (oviposition began), and 23rd July. Of these 600 insects dissection showed that 322 were males, 254 were egg-bearing females, and 24 were females which had completed oviposition. On the 24th July, 39 dissections were made, 34 males and 5 egg-bearing females being found. The same search was prosecuted in 1912 with similar results and the conclusions arrived at are, that males are more numerous when the moths first emerge; egg-bearing females are captured next—this being the efficacious period of trapping; and finally, females which have laid their eggs predominate. Trapping is then of no further use, unless the continued capture of males prevents numbers of females from being fecundated. This point requires proof. Bait-traps are thus justified, provided costs are kept down. The best system is to place all the traps in position and only bait a few in the most likely places. These latter must be inspected regularly and on noting the first captures all the other traps must be baited and kept so until the catches diminish, when again a few of the first should be kept going—simply in order to

obtain data about the next generation. The following costs are based on practice with a vineyard of 10 hectares (25 acres); earthenware pots of the stated dimensions costing 4*s.* 9*d.* per 100 delivered at the nearest station; 3 complete fillings—1 for each generation, and 15 refills—one every third day during the three 18-day average periods, each refill being of 80 c.c. (2⅘ oz.) The total solution required is 3,300 litres (726 gals.), to prepare which a maximum of 350 kilog. (770 lb.) of molasses costing 84*s.*, and 150 litres (33 gals.) of wine-lees costing 24*s.* are necessary. The cost of 2,000 pots is 96*s.*, which may be spread over 5 years, giving the cost for one year's operations as 19*s.* The total cost of labour (30 days at 2 francs) is 48*s.* Thus the total expense works out at £8 16*s.* per annum. The traps must be inspected about twice a week and all moths captured must be removed before re-filling to the original level. This system of bait traps is eminently suitable for application by co-operative associations.

La destruction du Puceron Lanigère. [Destruction of the woolly aphis.] *Bull. Soc. d'Etude Vulg. Zool. Agric., Bordeaux,* xiii, no. 1, Jan. 1914, pp. 14-15.

Three formulae are given which, upon the advice of M. Duval of Boulogne-sur-Seine, have been used against the woolly aphis (*Schizoneura lanigera*) and have proved satisfactory. (1) In the case of leaves and young shoots newly invaded, apply a spray made up as follows: Rain water, 1 litre; potassium carbonate, 4 gms.; sulphoricinate of soda, 30 gms.; methylated spirit, 30 gms.; nicotin (extract 100 gr. per litre), 10 gms.; the potassium carbonate is dissolved in water and the other ingredients added, the solution being boiled and stirred. Under the action of this spray the downy covering of the insects is dissolved and the insects themselves at length destroyed. (2) In the case of attacks on older parts of the tree, the spray must be applied as soon as the white down of the insects is observed; the foregoing formula may be used, but generally it is necessary to have recourse to some stronger spray, as at this time the insects are covered with a more resistant coat; the following formula is given: rain water, 1 litre; sulforicinate of soda, 40 gms.; American potash, 12 gms.; methylated spirit, 20 gms.; and nicotin extract, 20 gms. This solution is liable to damage the leaves more than the other, but not seriously. (3) The third formula given is for destroying the eggs in winter; it is recommended to fill all crevices and holes in the trunk and branches at the end of October with the following liquid: rain water, 1 litre; black soap, 350 gms.; sulforicinate of soda, 50 gms.; the soap is dissolved in warm water and the sulforicinate added, a thick syrup being formed, which can be applied with a brush. Woolly aphis which attack the roots should be destroyed at the end of November by opening the ground round the trees and spraying on the attacked roots the liquid recommended for the leaves and shoots.

Boucher (W. A.). **Orchard Work for February Codlin Moth.** *J. Agric., Wellington, N.Z.,* xiii, no. 1, 1914, p. 87.

Fruit-growers in New Zealand are advised to spray with a reliable brand of arsenate of lead before the end of the second week of February. Serious infection by codling moth has often occurred in February when spraying has been discontinued at the end of January.

DURRANT (J. H.) & BEVERIDGE (W. W. O.). **Army Biscuit Enquiry: Supplementary Notes.**—*Jl. Royal Army Med. Corps, London*, xxii, no. 2, Feb. 1914, p. 208.

For practical purposes it has been necessary to ascertain the exact average dimensions of the ova of *Ephestia kühniella*, Z., and a table of careful measurements has been furnished by Major S. Lyle Cummins, R.A.M.C. The average length appears to be 1·16 (millimetres) and the breadth 0·63 (millimetres). From these measurements it would appear that if, when screening flour, a mesh of 160 strands to the inch be relied upon to eliminate the ova of *E. kühniella*, such reliance must rest upon the assumption that the ova of this moth always approach the screen broadside-on.

At a discussion as to the possibility of placing contracts at any specified date or dates, it was demonstrated that, so far as *E. kühniella* was concerned, any immunity from this insect cannot be hoped for during the winter months, since moths are recorded as emerging in September, October, and November, and they continue to emerge plentifully in December, January, etc.; in fact, the species seems to be normally an autumnal insect.

[The standard of measurement of the ova is not stated, but is assumed to be millimetres.—ED.]

CAMPION (H. G.). **The Ravages of** *Bupalus piniarius* **in Prussia.** *Entomologists' Monthly Magazine, London*, Feb. 1914, p. 41.

During a visit to the forests of the Oberförsterei of Salmünster, Hessen Nassau, the author had the opportunity of seeing the great extent to which the common Geometrid, *Bupalus piniarius*, can multiply, and the damage the larvae can cause to the Scots Pine. The pronounced thinness of the crown later in the summer shows where the so-called "Spanner" has been at work. The most serious attack was over some fifty acres, where the trees were 60-70 years old; in this area 336 pupae were found within 10 square feet; a few of these (some 6 or 7 only), appeared red and contained the larvae of an unknown parasite.

JACK (R. W.). **The Cabbage Web-Worm.**—*Rhodesia Agric. Jl., Salisbury*, xi, no. 3, Feb. 1914, pp. 416-422. 1 pl.

The cabbage web-worm, a pest of cabbage and allied plants, has caused serious damage from time to time in Southern Rhodesia. In the case of such plants as turnips, kohl-rabi, etc., which have swollen crowns, the caterpillar usually occurs within the tissues. In young plants of cabbage, kale, etc., the heart is attacked and the insect forms a groove in the stem and is covered by a web, under which it feeds. The insect is undoubtedly the same as that which, in the United States of America, is called the "imported cabbage web-worm" (*Hellula undalis*, F.) It seems to be susceptible to even light frosts and probably ranges from the Mediterranean to Southern Rhodesia as an indigenous species. Detailed descriptions of the various life-stages are given. The different broods overlap greatly, all stages being found throughout the growing season and during the greater part of winter wherever food is available. Lack of food between

July and September is probably an important check to this pest, which is little attacked by parasites. Most damage seems to be done on irrigated crops in November. Much injury may be avoided by spraying or dusting plants of the cabbage family as a preventive measure. Any arsenical preparation may be used, such as arsenite of lime, arsenate of lead or Paris green, and spraying should be commenced while the plants are in the seed bed. For use, 3 lb. of arsenate of lead is added to 50 gallons of water; for Paris green, 1 lb. green and 2 lb. fresh lime (quick or water-slaked) is mixed with 160 gallons of water. In preparing arsenite of lime ¼ lb. of arsenite of soda is dissolved in a little hot water and made up to 25 gallons; 2 lb. of fresh lime after slaking should be mixed with 25 gallons of water; the two preparations can then be mixed. For dusting, use Paris green 1 lb., flour or lime 20 lb., thoroughly mixed together. For plants with smooth leaves a sticky substance should be added, such as a mixture of resin. This is made by boiling together 4 lb. resin, 2 lb. carbonate of soda crystals and 1 gallon of water. This quantity may be mixed with 50 gallons of spraying liquid and is most effective in connection with preparations containing lime. All plants should be destroyed as soon as their period of usefulness is past, since such plants, cabbage stumps, etc., serve as breeding grounds for insect pests such as web-worms, turnip sawfly (*Athalia rosae*), Bagrada bug (*Bagrada hilaris*), diamond-back moth (*Plutella* sp.), and cabbage aphis (*Aphis brassicae*), all of which occur in Southern Rhodesia.

VUILLET (A.). **Tableaux Illustrés.** [Illustrated Identification Tables.]—*Rev. Phytopath. App., Paris*, i, nos. 9-12, 5th Oct.-20th Nov. 1913, pp. 119-123, 138-140, 152-157, figs. 15. [Received 30th March 1914.]

These tables are intended to facilitate the identification of insect pests of cultivated plants in France and the neighbouring countries.

GAUMONT (L.). **Contribution à l'Etude de la Biologie du Puceron Noir de la Betterave.** [Contribution to the Study of the Biology of the Black Aphis of the Beetroot.]—*Rev. Phytopath. App., Paris*, i, nos. 16 and 17, 20th Jan. and 5th Feb. 1914, pp. 4-5.

The black aphis of the beetroot (*Aphis euonymi*) every year causes considerable damage to the crops in north and central France. The insects appear at the beginning of June on the young sugar and fodder beetroots, as well as on those left for seed. They multiply abundantly during summer, so that the lower leaves of the plants become yellow and shrivel up and the inflorescences remain small. The same injuries have been noticed by Jablonovsky in Hungary and by Mordwilko in Russia. According to Mordwilko, the insects pass the winter in the egg stage on the European spindlewood (*Euonymus europaeus*, L.) and alburnum (*Viburnum opulus*, L.) From this it would follow that destruction of these shrubs would be of great value to agriculture. The author, however, has found *A. euonymi* also on Japanese spindlewoods, which are very numerous in parks and public gardens; but even if all these shrubs were destroyed the aphis would still exist. The author observed at the end of October a field of beetroots in which

these insects were still present, both parthenogenetic and sexual forms, and the females were laying at the bases of the leaves. When the beetroots are gathered for fodder the leaves are taken away or cut the leaves and the collar, and the roots are stored in a cellar or pits. The eggs remain in the collar, hatch while in the cellar and in the spring spread to *Rumex*, *Chenopodium* and other wild plants. If the beetroots are left to go to seed, the females issuing from the eggs form new colonies at the base of the plant from which they emerge. The small beetroots are often left in the ground, and if these have eggs on them may be a means of infection in the spring. Thus it would appear that destruction of *Euonymus* and *Viburnum* would really be of little value.

MIDDLETON (T. H.).—**Annual Report of Horticultural Branch, Board of Agric. and Fisheries,** *London*, 1914, 57 pp., 8 maps.

Among the insect pests which have been scheduled by the Board is the large larch sawfly (*Lygaeonematus erichsonii*, Hart.) Affected woods in the Lake District were inspected by two of the Board's Inspectors who concluded that a recrudescence of the infestation had taken place; the intensity of the attack being higher in the Keswick district, except in Borrowdale and part of Thirlmere. The position of the infested woods and details of the attack are given. From the results it seems certain that it is not possible to rely on the presence of parasites to effect a complete extermination of the pest, the average percentage of insects found parasitised in the different woods being only about 29·4. The parasites show no tendency to increase in numbers and it would almost appear that when the number of sawflies is small the parasites turn their attention to some easier prey. Many cocoons were found in the northern woods, the contents of which had been removed, in some cases as many as those found parasitised, and it seems probable, therefore, that some other factor injurious to the sawflies is present. The condition in Wales is very satisfactory, in many places only the merest traces being found, and in others the pest was absent. The sawfly as a pest appears to have vanished from Wales, which has now resumed the same condition as obtains in the rest of the Kingdom, though the number of parasites, so far as is known, was never in a higher proportion than in many parts which still remain infested. During the month of November 1912 the Board received a report of an infestation by the vine louse (*Phylloxera vastatrix*) in a vinery in Gloucestershire. The disease had been noticed some time, the leaves of the plants growing prematurely yellow and little or no fruit being borne, but it was not till the vines were grubbed that expert advice was taken. When an inspector from the Board called to investigate the case all the vines known to be affected had been burnt and all the soil removed from the house. It was decided to grub all the vines in a house not touched, and part of the root was submitted to the Board's entomologist, who reported the presence not only of *P. vastatrix*, but of *Heterodera radicicola*. Though *Phylloxera* can survive under exceptional conditions in England, it spreads extremely slowly and there is no reason for supposing that it can ever become a serious menace to English viticulture. In 1912 also a single case occurred where the larvae of the Mediterranean fruit fly (*Ceratitis*)

capitata) survived for a considerable time in England. Larvae were found in Seville oranges and puparia were obtained from the tissue paper in which an Almerian orange was wrapped. As far back as 1868 the fly was recorded in England, having been bred from oranges, and hundreds of these larvae or pupae are imported every year inside oranges, and are killed in the preparation of marmalade. The presumption is, therefore, that the same conditions which have acted unfavourably to the cherry fly (*Rhagoletis cerasi*) in this country, will stop the development of *Ceratitis* also.

The season of 1912–13 produced very few new conditions in the state of Isle of Wight Disease among bees. Reports of its presence from certain districts were received and from time to time it appeared epizootically in different counties. No treatment has been regularly successful in effecting more than a temporary improvement.

La lutte contre les sauterelles: résultat des expériences de 1913. [Locust control: results from experiments in 1913.]—*Bull. bi-mens. Off. Gouv. Gén. Alger., Paris*, xx, no. 2, 15th Jan. 1914, p. 26.

This article gives the detailed information supplied by M. Verneuil, Director of Agriculture for the Province of Oran, who was sent by the Algerian Government to watch the tests made in the Tagremaret district by Dr. Sergent, Director of the Pasteur Institute in Algeria, with the *Coccobacillus* employed by d'Hérelle in the Argentine against locusts. The hoppers experimented on had hatched from eggs laid in the previous autumn by *Stauronotus maroccanus*. Dr. Sergent first ascertained them to be free from d'Hérelle's *Coccobacillus*. A batch was inoculated with pure bouillon and remained healthy, while individuals of another batch inoculated with infected bouillon began to die on the third day, and all rapidly perished except two or three which remained immune right through. The blood of the dying hoppers was used to prepare fresh and more virulent cultures; and after the virus had been passed through 11 locusts it caused death in 7 hours. A further 4 or 5 passages did not reduce this period of time, and Dr. Sergent considered this to be the minimum. Later on, however, Dr. Sergent experimented with adult locusts in the district of Beni-Ounif and was able to cause death in one hour. M. d'Hérelle states that by spraying the grass and the insects about 95 per cent. of the latter will be infected and killed. In the experiments made by Dr. Sergent to ascertain this point a negative result was obtained. After several days about 95 per cent. were very much alive. Of course, this method would in any case be impracticable owing to the quantity of spray necessary, and M. d'Hérelle reported that only the leaders of a column required spraying in order to provoke a spread of infection throughout the locust army. This was also tested, but after some 100,000 to 150,000 hoppers had passed over infected ground, and their leaders had been sprayed as directed, it was difficult to find any dead except a few which appeared to have been the victims of insect-eating spiders. In spite of the care and patience with which all these tests were made their ill-success was clearly apparent. The evident contradiction may perhaps be explained by one of the following considerations: (1) M. d'Hérelle may have been too sanguine, and the insects may have died quite independently of the *Coccobacillus* found in their

hoppers; (2) it may be due to the fact that he experimented only on *Schistocerca pallens* and *S. paranensis*; (3) he used adult locusts and not hoppers, and that insects resist the bacillus least when they are nearest death is a well-known theory; or (4) his success may be due to the fact that the climate of Argentina, where M. d'Hérelle worked, is warmer and moister than that of the Tagremaret district; these two factors are always of great importance in insect life. Dr. Sergent is continuing his experiments with the hope of getting practical results.

J. D. **Die Kosten der Schädlingsbekämpfung.** [The cost of combating pests.]—*Luxemburger Weinztg., Grevenmacher*, ii, no. 1, 1st Jan. 1914, pp. 12-14.

As the calculations published by numerous journals differ rather considerably, the author gives the costs based on his personal experience and on accurate data collected from vine-growers. They cover the cost of the material necessary for a rational and thorough campaign against plant and animal enemies of the grape vine, but do not include cartage, wages, or any other cultural expenses.

Spraying against Peronospora. A 2 per cent. Bordeaux mixture was applied three times a year on an average. To be of use, thorough spraying is essential and for this 194 gals. of mixture, or 39 lb. of copper-sulphate and 39 lb. of lime, are required per acre for each application. The Grevenmacher Vine-growers' Association supplies its members with Bordeaux mixture ready for use at approximately 1s. for 20 gals. This entails an outlay of £1 9s. 6d. per acre for three applications and the protection of the 4,000 odd acres of vineyards in Luxemburg means an expenditure of £5,900.

Sulphuring. As a rule three applications are necessary, and for these 66 lb. of sulphur are required per acre at a cost of about 9s. per 100 lb. This works out at about 6s. per acre, or £1,200 for the 4,000 acres of vineyards in Luxemburg.

Vine-moth control. According to tests made in 1913, it is necessary to spray with nicotin twice a year if any result worthy of the name is to be attained. It appears best to make up 22 gals. of spray solution with 3 lb. 3 oz. of copper-sulphate, 3 lb. 3 oz. of nicotin extract at 1s. 1d. per lb. and 1 lb. 10 oz. of soft soap. This costs about 4s. 6d. For a single application 132 gals. are required per acre, or 264 gals. a year. The cost per acre per year is about 54s., and the expenditure for Luxemburg would be about £10,800. The total expenditure for 4,000 acres will amount to over £18,000 per year, or £4 10s. per acre. As already stated this only covers cost of material required for control purposes.

SCHILLING (K.). **Sur Bekämpfung des Heu- und Sauerwurms.** [Combating the vine-moth.]—*Luxemburger Weinztg., Grevenmacher*, ii, no. 2, 15th Jan. 1914, pp. 28-30

At Geisenheim vine-moth control in 1913 included several trials which gave results as follows:—The insecticide "Golazin I'tötsi" was used with success against the second generation of the vine-moth and the grapes remained unharmed. They were also free from stem-rot. A quart of this insecticide cost 3s. 5d., and 2 quarts diluted in 25 gals. of water at once gave the 2 per cent. working solution. On an average

158 gals. are required per acre. Spraying must always be effected in the period from the end of the moth-flight up to the appearance of the first caterpillars. High pressure sprayers are the best, and every grape must be thoroughly wetted. A single application of this insecticide costs about £5 15s. per acre. The makers state that if applied in the same manner it is equally effective against the first generation. Apparatus used with Golazin must be thoroughly cleansed with a 5 per cent. solution of ammonia before it is employed with copper sulphate. Nicotin soap gave very fine results. The spray was made up of 20 gals. of a ½ per cent. lime-copper-sulphate solution, 4½ oz. of 90 per cent. purified nicotin and 2 lb. of soft soap. The soap is dissolved in a known quantity of boiling water, the nicotin is slowly and carefully mixed in and the lime-copper-sulphate solution is finally added. Before this latter solution is added its strength must be greater than ½ per cent., as the amount of water used for dissolving the soap must be exactly allowed for. Nicotin-soap is mainly a control of the second generation and must be applied immediately the moth-flight is over that is, from the 25th July onwards. Spraying is carried out as with Golazin. On an average 123 gals. are required per acre, and one man with two boys can cover that area in three days. Under local conditions the total expense will be about £3 4s. per acre. The same preparation, omitting the copper-lime mixture, was also tried but the results were not so good. The treated grapes matured in a healthy condition, but took from two to three weeks longer to do so than those sprayed with Golazin. In making up the insecticide both the nicotin and the soap must be of the best quality. Cottonseed oil soap is the best. A third test was made with a Hungarian product called "Kochillin" and was successful, although ripening was a little delayed. Kochillin is applied immediately after the vines are in flower, or immediately after the moth-flight of the second generation. It costs 2s. a lb. and is used as a 2 per cent. solution.

Die Bekämpfung des Heu- und Sauerwurms im Rheingau mit einem Schweizer Insektizid. [Combating the vine moth in Rheingau with a Swiss insecticide.]—*Neue Zürcher Zeitung, Zürich*, no. 34, Viertes Morgenblatt, 9th Dec. 1913.

The grape yield of 1913 has been the worst on record. Some growers, however, obtained remarkable results in combating the vine moth, which had generally been considered as beyond control, and averaged from one-third to one-half grape yield. The trials are referred to above, but the following data are new: In a vineyard of about 875 square yards treated with "Golazin Ütötsi" about 104 gallons of unstrained grape-must were obtained, while a neighbouring untreated one about 2,900 square yards only produced 82 gallons. In the former case treatment resulted in a full harvest.

Vuillet (A.). *Stephanoderes coffeae.*—*L'Agronomie Coloniale, Paris*, 31st Jan. 1914, i, no. 7, pp. 19-21.

Last September the Jardin Colonial received from the Lieutenant-Governor of the Gaboon a consignment of Liberian coffee berries attacked by a Scolytid beetle, which was found to be *Stephanoderes coffeae*, Hag. The female deposits an egg in the young fruit while it is still

green, towards the extremity or just above the scar left by the perianth. After about 8 or 12 days a white larvae emerges and penetrates into the berry. The larva completes its growth in three or four weeks and pupates in the seed, the adult insect appearing 15 to 19 days later. The presence of the beetle is revealed by two or three small holes, at the summit of the fruit. The pulp is simply crossed by the insect, and only the seeds are devoured by the larvae, so that at a certain distance the berries appear in good condition, containing only damaged seeds. According to Gowdey the best means of controlling *S. coffeae* is by gathering and destroying the attacked berries. This species proves to be widespread; the specimens originally described came from Uganda, but Hagedorn has since received examples from Angola, the Congo and Java. According to Morstatt it did not exist in German East Africa in 1912. In Uganda *Coffea arabica* appeared to suffer less from the attacks of this insect than indigenous coffee trees.

Verwendung des Karbolineums an Obstbäumen. [The use of Carbolineum on fruit trees.] *Schweiz. Zeits. Obst- und Weinbau, Frauenfeld*, 12th Jan. 1914, pp. 8-10.

In this article reference is made to a paper by Wenk in the *Geisenheimer Mitteilungen über Obst und Gartenbau*, and the following remarks are all taken from it. The incorrect use of carbolineum has led to its being discarded entirely by many experts. If properly applied it is a valuable agent. Scale-insects are easily destroyed if the trunk and branches of the tree are painted with a 40 per cent. solution. This strength kills the scales, which is not always the case with weaker solutions. Spraying must not be done with solutions above 15 per cent. in strength, as the young shoots and buds will suffer. It is of the greatest importance that carbolineum be used only when the sap-flow is in abeyance. From the beginning of February to the middle of March is the period advised by Wenk, as then the insects are leaving their winter refuges and, on the other hand, shoots and buds have not yet appeared. When they do so the use of carbolineum must be immediately discontinued. The product itself must be completely soluble in water and the actual percentage of carbolineum contained in it is of great importance, and should be guaranteed, as some inferior makes may contain over 90 per cent. of water and would prove very expensive in use. [See this *Review*, Ser. A, ii, p. 210.]

PIERCE (W. D.). **New Potato Weevils from Andean South America.**—*Jl. Agric. Research, Washington*, i, no. 4, Jan. 1914, pp. 347-352, 3 pl.

Potatoes sent to the United States from South America were found on several occasions to contain weevils, in all stages of development. Three species of weevil are involved, one of which, *Rhigopsidius tucumanus*, Hiller, has been already reported as found in potatoes shipped from Chile, Peru and Bolivia. [See this *Review* Ser. A, I, p. 546.] The other two species, described in the present paper, are new and represent new genera. One of these, *Premnotrypes solani*, was found in the adult stage, just under the skin of the potato, in a small cell in which the larva had evidently fed; from the material

received it is judged that the larva does not bore extensively into the potato. The other species, *Trypopremnon latithorax*, was found in cells in potatoes received from Peru; it breeds in a manner closely resembling that of *P. solani*.

BALLARD (W. S.) & VOLCK (W. H.) **Winter Spraying with Solutions of Nitrate of Soda**. *Jl. Agric. Research, Washington*, i, no. 5, Feb. 1914, pp. 437-444, 2 pls.

The main object of the experiments set forth in this paper was not so much the destruction of insect or fungus pests, as an attempt to feed trees and shorten their dormant period by spraying with nitrate solution, and the results, from this point of view, are interesting. The solution found to be most satisfactory consisted of nitrate of soda 200 lb., caustic soda 25 lb., water 200 gals. The result was to force the dormant buds out several days ahead of the normal opening period, and the apparent strengthening and increase of vigour of the trees was possibly useful in enabling them to resist the attack of insect and fungus pests.

CHATTERJEE (H. C.). **A Note on *Oxyrhachys tarandus*, Fabr.** *Ind. Forester, Allahabad*, xl, no. 2, 15th Feb. 1914, pp. 75-79, 2 pls.

Oxyrhachys tarandus (MEMBRACIDAE) occurs in many parts of India and is widely distributed in Africa. Among its food-plants are *Acacia siamea*, *A. arabica*, and *Casuarina* sp., reported from Madras; *Cassia fistula* and *A. arabica*, reported from Bihar (Pusa); *A. catechu*, *Albizzia lebbek*, *Albizzia procera*, *Phyllanthus emblica*, *Tamarindus indica* and *Dalbergia latifolia*, from Dehra Dun District. Injury is caused by the insertion of the proboscis into the young stems in order to suck sap, and to a greater extent by the incisions made by the saw-like ovipositor of the female while laying her eggs. The trees attacked become stunted and more exposed to the attacks of other insects. The eggs are laid in the bark of the young shoot, but there is very little definite information as to the length of the life-cycle. Descriptions are given of the egg, larva, nymph and adult. Until the life-history of this insect is worked out, no proper remedies can be laid down. In small nurseries and gardens where the insect is abundant the following measures may be adopted: spraying with kerosene and soap emulsion, keeping the ground between the trees clean and constantly ploughed, and handpicking. The eggs of *O. tarandus* have been found parasitised by a Chalcid.

TRÄGÅRDH (I.). **Gran- och tallkottarnes vanligaste skädeinsekter.** [The most common insect pests of pine and fir-cones.]—*Skogen, Stockholm*, i, no. 2, Feb. 1914, pp. 42-50, 5 figs.

Pissodes validirostris, Gyl., has on several occasions done great harm to fir-cones. The adult makes its appearance in July in the neighbourhood of Stockholm and feeds on the young cones; the larva hibernates in the middle of the cones and pupates in the spring, only one generation occurring a year. The attacked cones are easily recognised by their pale brownish yellow colour, which contrasts with

the green colour of the undamaged cones. They are very easily shaken off the trees, which makes it very probable that, as a rule, they drop to the ground before they are ripe. In 1907, on the island of Gotland, 22·27 per cent. of the cones were damaged by this weevil. This year Mjöberg found no less than 80 per cent. of the larvae parasitised, a fact which seems to indicate a possible method of fighting the insect. The Anobiid beetle, *Ernobius abietis*, makes its appearance in July; the amount of damage it does in Sweden is not known

Laspeyresia strobilella occurs throughout Sweden to Lapland. The cones attacked by the caterpillar very often do not differ in appearance from healthy cones. In the autumn the larva does very little damage to the cones, only 6–10 per cent. of the seeds being devoured, but if they are stored in a warm room during the winter the seeds are attacked one after the other, so that by April or May all of them are eaten It follows from this that the earlier the seeds are shelled the better.

Another cone moth, *Dioryctria abietella*, has not been recorded as doing any harm until last summer, when the author found it plentiful everywhere in the vicinity of Stockholm. Its mode of attacking the cones differs greatly from that of *L. strobilella*, it being much larger and accomplishing its feeding in the autumn. As a consequence it devours a much greater part of the cone than *strobilella*, and furthermore it throws out heaps of frass on the surface of the cone. It makes winding galleries in the centre of the cone, feeding on the seeds and on the basal parts of the scales, the latter becoming anchor-shaped, as already observed by German entomologists.

The seeds of these conifers are also attacked by an, as yet, undescribed Chalcid of the genus *Megastigmus*, and by gall-midges which are not identical with those described from Austria.

SMITH (H. S.). **Mealy Bug Parasites in the Far East.** —*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, pp. 26-29.

In this paper the author reports on his visit to Japan and the Philippines with a view of obtaining natural enemies for Californian pests. Attention was first turned to the enemies of *Pseudococcus citri*. In Japan, where the mealy bug is never a pest of any importance, three enemies of this insect were found. One is a ladybird, the name of which is unknown to the author; it resembles *Cryptolaemus montrouzieri*: the others are parasitic wasps, a small metallic blue Encyrtid and a Proctotrupid, which lay their eggs in the very young mealy bugs. A good breeding stock of these parasites is now in the insectary in California. In the Philippines *P. citri* was not encountered, though a similar species occurs, and the ladybirds *Pullus fuscatus* and *Aspidimerus orbiculus* were found feeding on it. *Spalgis substrigata* was found to be a very important factor in the control of mealy bugs. A single larva of this butterfly would frequently clear an entire twig of mealy bug larvae and eggs; but this type of insect is very difficult to breed in confinement. Two species of Chalcid flies were also found attacking *Pseudococcus*, but to a far less extent than the foregoing insects. Two species of Diptera of the genus *Diplosis* do good work against mealy bugs of guava and *Hibiscus* in the Philippines, feeding in the larval stage upon the eggs and young. Several other enemies

of the mealy bug are found in the Orient, but they are of minor importance. In the vicinity of Manila a number of parasites of *Saissetia hemisphaerica* were obtained in the hope that they would attack the black scale in California. This they seem to do in the insectary, but they have not been tried in the field. One Pteromalid attacks the eggs of the scale. Two other Encyrtids attack the young scale before eggs are laid. Tentative arrangements have been entered into with the Imperial Department of Agriculture of the Japanese Government and the Bureau of Agriculture of the Government of the Philippines for co-operation with the State Commission of Horticulture at Sacramento in the attempt to introduce the natural enemies of Californian pests.

COOK (A. J.). **The White Grubs.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, pp. 29-30, 1 fig.

White grubs (the larvae of various Scarabaeid beetles) feed on roots of grasses and other plants. The rose chafer, *Macrodactylus subspinosus*, of the Eastern States causes much damage. The various May beetles are also serious pests, devastating lawns and meadows, and working havoc in strawberry beds and among vegetables. The common one in California is *Ligyrus gibbosus*, and in Michigan *Lachnosterna fusca*. As a control measure, if the meadow is seriously attacked, it should be ploughed up and some other crop grown. A badly attacked lawn can be treated in the same way and clover may be substituted, as it is not affected. On lawns, carbon bisulphide can be used, $\frac{1}{4}$ oz. of the liquid being poured into holes about three feet apart, which should at once be closed.

ESSIG (E. O.) **The Cherry Fruit Sawfly.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, pp. 31-35, 3 figs.

The cherry fruit sawfly (*Hoplocampa cookei*) was first reported from the Suisan Valley, Cal., in 1883. It is a native of California and other Pacific Coast States. Considerable damage has been done to cherry crops by the larvae, the injury consisting of one or more clean round holes bored through the fruit to the kernel, which, if soft, is devoured as well as the fleshy part around it. The fruit becomes discoloured and falls to the ground. It is stated that in order to control this sawfly effectively, from two to three applications of lead arsenate at the rate of 4 to 5 lb. of arsenate to 100 gals. of water, may be necessary. As a rule two good applications are sufficient, the first being made shortly before the blossoms open and the second about ten days later. Autumn ploughing is recommended to kill the larvae and pupae in the soil. A 3 per cent. distillate-oil emulsion, to which has been added nicotin sulphate at the rate of one part to 2,000 parts of water, has also been suggested. The insect has been reported as occurring in the Suisan Valley, El Dorado and Nevada counties, California, and at Medford, Oregon, where it is confined to a very small area. The orchard fruits reported to have been attacked are cherry (sweet and sour), prune, plum, peach and apricot (the last two only occasionally).

COOK (A. J.). **The Cherry and Pear Slug.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, pp. 40-41, 1 fig.

The pear slug *Eriocampoides* (*Caliroa*) *cerasi*, is a sawfly of European origin and is widely distributed, occurring wherever the cherry and pear are cultivated. The eggs are deposited in the stem or leaf in late spring and early summer. The larvae feed on the green parts of the leaves, attacking chiefly the cherry and pear. Arsenicals are very effective against these insects, but, owing to their viscid secretion, lime or even earth-dust thrown on them is an excellent means of destroying them.

FAWCETT (H. S.). **Does Bordeaux Paste cause Injury when followed by Fumigation?**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, pp. 41-43, 1 fig.

It has been noticed that if spraying with Bordeaux mixture is followed too soon by fumigation with hydrocyanic acid gas, the trees are more likely to be injured than those not sprayed, resulting in partial defoliation and killing back of the small twigs. This does not seem to be true in the case of lime-sulphur spraying. Trees were treated with Bordeaux paste on the trunks and fumigated soon afterwards: no apparent injury resulted. This has been successfully repeated several times. It would, therefore, seem that where the proper precautions as to weather and moisture conditions are observed by the fumigator, there is no injury to be feared from the Bordeaux paste, even when applied to the large limbs.

ESSIG (E. O.). **Insect Notes.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 1, Jan. 1914, p. 47.

The sweet-birch scale, *Chionaspis salicis-nigrae*, Walsh, was taken by the author recently in the Sierra Nevada Mountains, where it appears to be common, east of the Sacramento Valley. The sweet birch, *Ceanothus integerrimus*, H. & A., is generally attacked at the base near the ground, and the infested areas appear as if whitewashed. In not a few cases the entire bush was killed by this insect. The pine-leaf scale, *C. pinifolia*, is exceedingly common on *Pinus ponderosa*, Dougl., in the vicinity of Forest Hill (Placer County), as also is the black pine-needle scale, *Aspidiotus californicus*, Colm. In the same county *Kermes cockerelli*, Ehrh., and *Aspidiotus densiflorae*, Bremner, were taken from *Quercus chrysolepis*. The destructive grasshoppers, *Melanoplus devastator*, Scudd., *M. cinereus* and *Schistocerca venusta*, Scudd., were found along the north fork of the American River.

COOK (A. J.). **Alfalfa.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 2, Feb. 1914, pp. 53-73, 17 figs.

In a lengthy article on the cultivation of alfalfa, the author notes among the pests of this crop in California the following insects:—Army worm (*Peridroma margaritosa* var. *saucia*), locusts (ACRIDIIDAE), the alfalfa butterfly (*Colias eurytheme*), wireworms (ELATERIDAE), the alfalfa looper (*Autographa gamma californica*), the alfalfa crane-fly (*Tipula simplex*), the apple leaf-hopper (*Empoasca mali*), clover mite (*Bryobia pratensis*), grain thrips (*Euthrips tritici*), grass leaf-hopper

(*Typhlocyba comes*), the twelve-spotted cucumber beetle (*Diabrotica soror*), the western army worm (*Chorizagrotis agrestis*) and the serpentine leaf-miner (*Agromyza pusilla*). Poisoned bran-mash placed in affected areas kills both the army worms and locusts. The hopper-dozer, with a shallow pan of kerosene oil, drawn through the field will often capture the hoppers by the millions. The alfafa weevil, *Phytonomus posticus*, has not yet been found in California. [For list of Russian and European pests of lucerne, see this *Review*, Ser. A, i, pp. 526-27.]

CHILDS (L.). **The Large Narcissus Bulb Fly.**—(*Merodon equestris*, Fab. *Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 2, Feb. 1914, pp. 73-76, 2 figs.

This fly, belonging to the family SYRPHIDAE, in the larval stage causes much damage to narcissus bulbs. The native habitat of *Merodon equestris* is Southern Europe, whence it has spread into England and Northern Europe and later to America and New Zealand. The larva feeds vigorously on the soft scale of the bulb, hollowing out the centre, so that infestation is often difficult to detect. The larva, pupa and adult are described. The eggs are laid at the base of the leaves and the larvae later bore into the bulb. The treatment of infested bulbs has been dealt with by Mr. R. Stewart MacDougall [see this *Review*, Ser. A, ii, pp. 88-89.] The following plants have also been reported to have been attacked by *M. equestris*: *Amaryllis*, *Vallota*, *Habranthus*, *Eurycles*, *Saltonia*, and the bulbs of the wild hyacinth, *Scilla nutans*.

SMITH (H. S.). **The Season's Work with** *Hippodamia convergens*. *Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 2, Feb. 1914, pp. 77-78.

During the season of 1914 it is hoped to carry on the distribution of this beneficial insect on a greater scale than in the past. Mr. Branigan reports a number of colonies, not before utilised, in the Sierras, and it is hoped to exceed the hundred million before the end of the year. Owing to the repeated damage caused by *Aphis avenae* to barley from February until the melon aphis season, it is proposed to release *Hippodamia convergens* upon the barley aphis during February, and by this means it is hoped to check the melon aphis plague in Imperial County.

NAKAYAMA (S.). **A Japanese Formula for Destroying the Woolly Aphis.** —*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 2, Feb. 1914, p. 80.

Mr. T. Machida, of Japan, recommends for the woolly aphis the following mixture:—Rape-seed oil, $3\frac{1}{2}$ pints; sulphur, $1\frac{1}{2}$ oz.; turpentine, $7\frac{1}{2}$ oz. The rape-seed oil should be boiled alone for a short time and then the turpentine slowly added and thoroughly mixed. Next stir in the crushed sulphur. The attacked parts of the tree are painted with this wash, which is also recommended for other aphids and for the destruction of their eggs.

VOSLER (E. J.). **Calendar of Insect Pests and Plant Diseases.** —*Mthly. Bull. Sta. Comm. Hortic., Sacramento, Cal.*, iii, no. 2, Feb. 1914, pp. 81-85.

The author suggests the following methods of control for insect pests to be carried out at about the time he writes. The almond mite, the eggs of which are deposited in the autumn on the twigs, hatches in spring and damages the tender growth. Commercial lime-sulphur solution with flour paste seems effective in the control of this pest. The following formula is suggested:—100 gals. water, 4 gals. flour paste, 5 quarts lime-sulphur solution, 2 lb. iron-sulphate. Another mite destructive to fruit is the pear-leaf blister mite, which can only be controlled commercially in the adult stage, as the eggs and young are inside the leaves. A. L. Quaintance recommends a lime-sulphur wash of 20 lb. lime, 15 lb. sulphur, and water to make 50 gallons. The application should be made just before the leaves are out. The spring canker-worms, attacking the foliage of the elm, cherry and prune, may cause entire defoliation of their host. In early spring the wingless female moth crawls up the tree to deposit its eggs on the bark. Tree tanglefoot or any adhesive bands will prevent the ascent of the female, and the eggs laid below the bands can be readily destroyed. Arsenate of lead, 5 lb. to 100 gals. of water, sprayed on the foliage will destroy the young caterpillars. The government formula for spraying pear thrips consists of 3 per cent. distillate emulsion combined with "Black-leaf 40," 1 to 2,000 parts of water. Among the citrus fruit insects the citrus mealy bug is discussed. E. O. Essig finds that a carbolic acid emulsion spray, plentifully applied (10 to 15 gallons to an average-sized tree), is the best remedy. Sometimes two or four applications, a week apart, are necessary; winter or early spring spraying seems the best. Fumigation has given good results, but has not been so effective as the emulsion. The ordinary black scale dosage is the one generally used. No practical remedy for the grain aphis, at the time they appear in spring, is known. The asparagus beetle appears as soon as the asparagus shoots emerge from the ground. Control measures used against this insect consist of cutting and burning egg-infested shoots, and after the crop has been harvested, spraying the plants with arsenical sprays, using 1 lb. of arsenate of lead to 16 gallons of water.

ESSIG (E. O.). **Insect Notes.**—*Mthly. Bull. State Comm. Hortic. Sacramento, Cal.*, iii, no. 2, Feb. 1914, p. 85.

J. P. Lyons reports *Aphis avenae*, F., doing serious damage to oats in the Imperial Valley. The maple plant louse (*Drepanaphis acerifolii*, Thos.,) has been reported as occurring on maple at Hanford, Cal., and the author has repeatedly taken it at Sacramento. *Aspidiotus perniciosus*, Comst., has been found in large numbers in pear orchards in Yolo County, near Sacramento, and *A. hederae* has been found on palm leaves. The following species of *Pseudococcus* have been taken in the vicinity of Upland, Cal.:—*P. crawii* on white sage; *P. artemisiae* on *Artemisia californica*; *P. bakeri* on the foliage and fruits of oranges and lemons, roots of nightshade (*Solanum douglasii*) and wild sunflower, also upon Grevillea, ivy, *Senecio* and other ornamental

plants; and *P. solani* on the roots of nightshade, wild sunflower and tomatoes. *Tortrix citrana* is also common in Upland on orange trees.

VASSILIEV (E. M.). **Два новыхъ для Россіи вредителя сахарной свекловицы изъ Туркестана.** [Two insect-pests of sugar-beet from Turkestan, new to Russia.] **«Вѣстникъ Сахарной Промышленности.»** [*Herald of the Sugar-Industry*], *Kiev*, no. 5, 1st Feb. 1914, pp. 68-75.

Before the establishment of the Entomological Station of Turkestan in Tashkent in 1911, very little was known of the insects injurious to sugar beets in that country. In an article by the author published in 1906 he recorded some of these, namely, *Stauronotus maroccanus*, Thb., *Chloridea obsoleta*, F., and the larvae of an unknown species of ELATERIDAE. In the first report of the above station, published in 1912, two new pests of sugar-beets are mentioned: *Laphygma exigua*, Hb., and *Phlyctaenodes nudalis*, Hb. According to the author, the latter insect is quite a new pest of sugar-beet, as up till now only two species of the genus *Phlyctaenodes* were reported as injurious to this plant, *P. sticticalis*, L., and *P. similalis*, Guen. The information given in the report as to *P. nudalis* is very scanty, only the damage done by the caterpillars to the young central leaves being mentioned. As to the natural food-plants of this species, only *Camphorosma annua*, Pall. (Chenopodiaceae) and *Echium* (Boraginaceae) have been previously recorded. The author suggests the following remedies: (1) the destruction of weed grasses; (2) the destruction by burning or by naphtha of the sprouts of beet taken out while digging; and (3) the catching of the insects on fermenting molasses.

The geographical distribution of *Laphygma exigua* is very great, it being found in Europe, Asia, Africa and America. The caterpillars injure maize and potatoes in South Europe; maize, beet and cotton seed in North America; cotton seed, lucerne, maize and sugar-cane in Egypt; and, in addition to all these plants, also cabbage, *Hibiscus*, *Corchorus*, *Carthamus*, *Amaranthus*, lentils, etc., and especially *Indigofera tinctoria* in India, where they are most injurious. In Russian Turkestan injury by this pest was noticed from the beginning of June 1911; in one locality in the district of Tashkent they devoured in 1911 about 540 acres of beet-root, in addition to damaging various other crops. In Turkestan the insect winters in the pupal stage, whereas in North America it is the moths that hibernate. The number of generations of this pest is two in America, three in Southern California and two (May-June and September) in Europe; the number of generations in Turkestan is unknown. As enemies, Tachinids are mentioned, which are responsible for the destruction of about 50 per cent. of the caterpillars in India, also a Sphegid wasp (*Ammophila* sp.) some predaceous beetles, bugs (*Canthacona furcellata* in India) and birds. Nothing is known of its enemies in Turkestan or Astrachan.

The following remedies are suggested. Against the imago, trapping with fermenting molasses; it is important to set the traps before oviposition has taken place. In India, the eggs are collected by hand, and lucerne is grown as a bait plant, being cut and destroyed at the proper time. The author suggests also the removal from the plantations and the destruction of weeds and all plants which have been hoed up.

Against the caterpillars, spraying with a solution of Paris green and lime in water (1-1½ oz. of green and the same amount of lime in 2·7 gallons of water) is considered the best remedy in Turkestan; "Djipsin" and barium chloride gave negative results. In India and North America arsenical sprays are used, and also kerosene emulsion in America. In India the attacked fields are surrounded by trenches as traps. Against the pupae, the cultivation of the soil is suggested by Plotnikov; it has also been noticed that the pupae perished when water was poured over them, so that by combining spraying and watering the pests may be rapidly destroyed.

DEAN (G. A.). **Grasshopper Control Work in Western Kansas.**—*Jl. Econ. Entom., Concord*, vii, no. 1, Feb. 1914, pp. 67-73, 2 pl.

A very successful campaign against grasshoppers was carried out in the summer of 1913 in Western Kansas, where for some years past these insects had devastated acres of cultivated land. The most common species were *Melanoplus differentialis*, *M. bivittatus*, and *M. femur-rubrum*. In the control work poisoned bran mash, made according to the following formula, was used: Bran 20 lbs., Paris green 1 lb., syrup 2 qts., 3 oranges or lemons, water 3½ gals. The bait when flavoured with oranges or lemons was found to be more attractive to the grasshoppers. The damp mash was sown broadcast in the infested area early in the morning; using the above quantities it should be scattered so that 5 acres are covered. As the poison does not act quickly the insects are not found dead until two or three days later. A very small quantity of the poison is sufficient to cause death.

The success met with in the campaign described in the present paper was largely due to the co-operation of most of the farmers with the county commissioners, who had circularised the farmers giving them the exact methods to adopt and supplying them with the necessary ingredients for the poison. In some counties 60-70 per cent. of the insects were killed, in others as many as 90 per cent.; in all cases the few that remained were kept in check by their natural enemies.

HUNTER (S. J.) & CLAASSEN (P. W.). **Grasshopper Control in the Southern Division of Kansas.**—*Jl. Econ. Entom., Concord*, vii, no. 1, Feb. 1914, pp. 73-83, 3 pl.

The University of Kansas, which for several years has been associated with the problem of grasshopper control in the State, organised in 1913 a campaign against these insects, which received the co-operation of most of the farmers of Southern Kansas. The method of control employed, similar to that employed in Western Kansas, consisted of distributing poisoned bran mash in the infested areas. The formula for the bran mash was as follows: Paris green or white arsenic 2½ lb., bran 50 lb., 6 oranges or lemons, syrup 4 qts., water 5 gals. The dry ingredients are mixed together, and then the syrup and oranges or lemons; the water is not added until the day of use. The bait is scattered broadcast in the infested areas between 5 and 7 o'clock in the morning.

Chickens eating the poisoned grasshoppers do not appear to be affected. The bran mash loses its effect as soon as it is dry. In alfalfa fields about 240,000 grasshoppers were killed per acre with one application. Poison for this experiment was scattered broadcast through the field, using 4·5 lb. to the acre at a cost of not over 6d. per acre. This was carried out in a field where the alfalfa was fully grown; a more effective means is the mowing of the field, leaving strips of standing alfalfa 4-6 feet wide and about 75 yards apart. The grasshoppers soon collect in these strips and are thus readily poisoned with small amounts of the bran mash, or easily caught with the hopper dozer. By these means a grower of the largest crops of alfalfa was able to harvest three crops before the first of August, where in an untreated field, kept as a control near by, only one crop was harvested in the same time.

Experiments were made to determine the attractiveness for the insects of baits where the expensive lemons were replaced with less expensive ingredients such as anise oil, stale beer, or vinegar, or left out altogether. The experiments showed that the insect has a keen sense of smell and is easily attracted to the bait put out for it; lemons render the bait 26·5 per cent. more effective than any of the other ingredients tried.

Burgess (A. F.). **Outline of the work on the Gipsy Moth and Brown-tail Moth conducted by the Bureau of Entomology, U.S. Department of Agriculture.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 83-87.

The author gives an account of the methods adopted to prevent the spread of the gipsy moth (*Lymantria dispar*) and brown-tail moth (*Euproctis chrysorrhea*) from the infested region in New England to other parts of the United States. The experimental work consists of the study of the life-history and habits of parasitic and predaceous enemies, with a view to propagating them in the infested areas; field observation work is done during the summer and autumn and records kept of the increase or decrease of the species in a given area, and of the defoliation on the trees concerned; food-plant work is carried on in the laboratory, caterpillars of the gipsy moth being fed on selected food-plants, and records kept of their preferences for different plants; factors concerned with spread of the insect are investigated, such as wind, temperature, etc. Investigations on the wilt disease, which attacks the gipsy moth caterpillars and destroys large numbers of them, are being conducted. Many trees that have been defoliated by the gipsy moth are attacked by bark borers (Scolytidae); oak trees suffer seriously in this respect: attempts are being made to determine whether such pests can be controlled economically.

Work is being done in co-operation with the Forest Service to determine whether different species of timber trees are more or less resistant to moth attacks. The territory infested by the gipsy moth and brown-tail moth has been placed under quarantine, and regulations have been made providing for the inspection of forest and nursery stock that is shipped from the infested territory to other parts of the United States. The country adjoining the infested territory is under inspection.

ROGERS (D. M.). **The Gipsy and Brown-tail Moth Quarantine.**—*Jl. Econ. Entom. Concord.*, vii, no. 1, Feb. 1914, pp. 116-117.

An account is given of what is being done by the U.S. Department of Agriculture to prevent the spread, by the inspection of various products, of the gipsy and brown-tail moths. The area quarantined on account of the gipsy moth includes parts of Maine, New Hampshire, Massachusetts and Rhode Island—about 15,230 square miles. The brown-tail moth area includes all the gipsy moth area and about 17,000 square miles in addition, affecting portions of each of the New England States. The inspection of plants and forest products includes the examination of lumber, cordwood, logs, poles, posts, bark, pulp wood, rough lumber used in crating finished products, barrel hoops, barrels, boxes and other products which might be chosen by a gipsy moth as a place on which to deposit her eggs. Many commodities not strictly included in products of the forest were examined, such as stone taken from quarries in woodlands in the infected areas, on which egg-clusters are often deposited.

DAVIDSON (W. M.). **Plant-Louse Notes from California.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 127-136, 8 figs.

The following species of APHIDIDAE have been taken in different parts of California, and short notes are given of their mode of occurrence, migrating habits, life-histories, etc.: *Pemphigus californicus*, Davidson, on leaves of ash; *Lachnus thujafolinus*, Del Guercio, on cultivated Thujas; *L. ponderosae*, Williams, on *Pinus ponderosa*; *Phyllaphis? querci*, Fitch, on *Quercus agrifolia*, Nee; *Chaitophorus* sp. on *Quercus lobata*, Nee; *Euceraphis betulae*, Kalt., on cultivated birches; *Euchallipterus arundicolens*, Clarke, on leaves of bamboo; *Myzocallis quercus*, Kalt (?), on *Quercus robur*, L.; the last four are fully described; *Monellia caryella*, Fitch, on leaves and nuts of *Juglans californica*, Watson; *Aphis houghtonensis*, Throop, on wild currant; *A. frigidae*, Oestl., on *Artemisia californica*; *A. atriplicis*, L., on *Chenopodium murale* and *C. album*; the last two are described; *A. bakeri*, Gillette, on sunflowers, artichokes, etc.; *Hyadaphis xylostei*, Schrank, on *Conium maculatum*; *Rhopalosiphum nervatum* sp. n., on hazelnut; *Myzus fragaefolii*, Clarke, on strawberry leaves and stalks: the last two are described; *Phorodon galeopsidis*, Kalt., on *Polygonum* sp.; *Amphorophora rubicola*, Oestl., on thimbleberry (*Rubus nutkanus*); *Macrosiphum ludovicianae*, Oestl., on *Artemisia heterophylla*; *M. rudbeckiae*, Fitch, on the teasel.

PARKER (J. R.). **The Life-history of the Sugar-beet Root Louse (*Pemphigus betae*, Doane).**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 136-141.

Pemphigus betae is the most important pest of the sugar-beet in Montana, and each year does considerable injury, the tonnage in badly infested fields sometimes being reduced to a third. The life-cycle of the insect has been worked out and is briefly as follows. Wingless viviparous females are found upon the roots of beets, weeds and grasses all the year round; in the autumn winged individuals are produced which fly to cottonwood trees and deposit the true sexes; the sexes

mate and the female deposits a single winter egg in the crevices of cottonwood bark; the following spring the young louse hatching from the egg ascends the tree and forms a gall, in which a single generation of lice is produced, all of which are winged and become the summer migrants; these migrants fly to beets, weeds and grasses and upon the leaves of these plants give birth to young which descend to the roots and start new colonies of wingless viviparous females.

MATHESON (R.). **The San José Scale in Nova Scotia.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 141-147, 1 fig.

In that part of Nova Scotia extending from Windsor to Digby known as the "fruit belt," the San José scale (*Aspidiotus perniciosus*) appeared for the first time in 1911. In spite of the severity of the climate compared with that of the more southern areas infested by this insect, it has survived through two winters and in 1913 gave rise to two complete generations, a third being expected. In the spring of 1913 a thorough inspection was inaugurated, the object of which was to find out the number of trees destroyed by the scale on various properties under different conditions of cultivation, size, spraying methods, etc. The details of these conditions are not cited, but tables are given which show that the number of trees destroyed in 1913 after control methods had been adopted was greatly reduced from the number destroyed in 1912, before such control had been begun. The author believes that it is possible to eradicate this pest, or to keep it in check so that there will be no danger of the old orchards becoming infested, provided that the regulations governing the admission of nursery stock into the province be properly enforced.

NEWELL (W.). **A natural enemy of the Argentine Ant.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 147.

The abundance of the Argentine Ant (*Iridomyrmex humilis*) in the southern part of Louisiana and Mississippi is probably due to the absence of both parasites and predaceous enemies. In September 1913 ants, identified as *Eciton* (*Acamatus*) *schmitti*, Emery, were found raiding the colonies of *I. humilis*, destroying adults and carrying off the larvae and pupae; the Ecitons appear to be very effective in their predatory work, destroying practically all the individuals of *I. humilis* in the territory which they raid, and in some of the orange groves which were formerly threatened with complete destruction, on account of the great abundance and activities of *I. humilis*, hardly a specimen of that species can be found since the visit of the Ecitons. The territory where the Ecitons have been found is on the west bank of the Mississippi, below New Orleans; this territory is almost completely surrounded by water, so that it is improbable that the Ecitons will be able to leave it; the species has probably been established there for many years past. This ant, which is the first important enemy of the Argentine ant to be discovered, belongs to the same family as that species itself.

COCKERELL (T. D. A.). **A new Cotton Scale from Panama.** —*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 148.

A new species of scale-insect, *Icerya zeteki*, is described from a specimen in a collection of COCCIDAE made in the Panama Canal Zone. The plant on which the insect was taken was undetermined.

FELT (E. P.). *Acaroletes pseudococci*, **sp. n.** —*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 148-149.

A new species of midge has been reared by Prof. Quale from *Pseudococcus citri*, collected by him in Sicily, and is described under the name *Acaroletes pseudococci.*

KING (G. B.). **A new species of *Kermes* from Connecticut.** —*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 150-151.

A new species of *Kermes*, *K. waldeni*, is described from specimens taken on oak at Portland, Connecticut.

FINK (D. E.). **Ammonia Gas as a Fumigant.** —*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 149-150.

Experiments have been made, and are still being carried on, to ascertain the value of ammonia gas as a fumigant for stored grain. In one experiment six quart bags containing cow peas and living weevils were placed in a fumigation box of $8\frac{2}{3}$ cubic feet capacity; 2 oz. of concentrated ammonia were used, and as a result an average of about 76 per cent. of the weevils were killed. When 3 oz. of ammonia were used, other conditions being the same, 100 per cent. of the weevils were killed. Using 3 oz. of ammonia and 50 lb. bags of grain 75-85 per cent. of the weevils were killed. Experiments were tried with a 100 lb. bag, the amount of ammonia used being increased by 1 oz. per cubic foot, but this failed to give a high mortality.

CHITTENDEN (F. H.). **The Colorado Potato Beetle Migrating to the Pacific Coast.** —*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 152.

Specimens of the Colorado Potato Beetle (*Leptinotarsa decemlineata*, Say) have been found at Colton, Washington; earlier writers stated that the Rocky Mountains afforded an impassable barrier which would prevent these insects from spreading westwards, and it is probable that this case of their occurrence in the West is due to the agency of man.

PEAIRS (L. M.). **On a Food-Habit of *Alabama argillacea*.** —*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, pp. 152-153.

Moths of *Alabama argillacea* were reported as damaging peaches in the autumns of 1911 and 1912 in orchards at Keyser, Mineral County, W. Va. The moths punctured the skin of the ripe fruit and fed on the juice; the injured fruit would be normal in appearance until picked, when it would be found to have soft spots about an inch in diameter surrounding the punctures, rendering it unfit for packing and even for local use. Only the late varieties were injured; in these the damage was as much as 75 per cent.

PEAIRS (L. M.). *Spilogale* **feeding upon Peach-tree Borer pupae.** *Jl Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 153.

Attention has been called to the value of the common pole-cat (*Spilogale interruptans*) as an insect destroyer. This animal has frequently been observed removing the pupae of the peach-tree borer (*Sanninoidea*) from the soil; on one occasion a pole-cat was observed to go from tree to tree searching for the pupae, which it dug out and devoured.

NEWELL (W.). **Occurrence of the Argentine Ant in Texas.** *Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 153.

On 5th January 1914 the author found a heavy infestation by *Iridomyrmex humilis*, Mayr, throughout the business and residential sections of Beaumont, Texas. The insect seems to have been established in this locality for the past five years. The occurrence of the ant at this point, on the main line of the Southern Pacific Railway, confirms previous observations that the most rapid dissemination of the insect takes place along the lines of heavy railway traffic.

RITOV (M.). **Новыя средства борьбы съ вредителями плодовыхъ садовъ.** [New remedies against insect-pests of orchards.] **« Прогрессивное Садоводство и Огородничество.»** [*Progressive Horticulture and Market-Gardening,*] *St. Petersburg*, 18th Jan 1914, p. 13.

In a short note the author deals with a new insecticide, which is offered by the firm Aug. Linde, Moscow, under the name of "Vegetin." It is claimed that the "carbolineum quite dissolved in water," which forms part of this remedy, supplies to it all its advantageous qualities. According to experiments of Russian phytopathologists, carbolineum has proved useful in a 10 per cent. solution as a remedy against canker or frost injuries, also against *Lymantria dispar*, SCOLYTIDAE and COCCIDAE when sprayed on leafless plants; but against fungus diseases it has proved ineffective, and besides has caused burning. The author is of opinion that the same effects of carbolineum will appear in Vegetin besides, this insecticide, as it contains carbolic compounds, requires special and expensive sprayers. The price of Vegetin is about 6*d* per lb.

STEINBERG (P.). **Вредители радиса.** [Insect-pests of radish.] **« Прогрессивное Садоводство и Огородничество.»** [*Progressive Horticulture and Market-gardening,*] *St. Petersburg*, 8th March 1914, pp. 239-240.

The author suggests some methods of dealing with the larvae of *Agriotes segetis*, Bjerk. (ELATERIDAE). As a result of his own observations he is satisfied that the introduction of lime into the soil is a very effective remedy; also a dressing of ashes, or the use of mineral manures generally. Carbon bisulphide proves effective only in friable soil, whereas lime can be applied with success in hard (clay or peat) soils. He recommends the following way of applying potato baits. Large tubers are cut into slices of about half inch thick, two of which are put

together, the inner side of one slice being covered with Schweinfurt green or arsenic; in order to keep the slices in position they are fastened with wooden pins (matches). These pieces are then buried to a depth of about three to four inches, after the beds are quite ready for sowing. They attract the larvae, which eat into the poisoned slices and perish.

Rolet (A.). **Désinfection des sols par le sulfure de carbone.** [Soil disinfection with carbon bisulphide.]—*Journ. Agric. pratique, Paris*, xxvii, no. 3, 15th Jan. 1914, pp. 89-91.

The use of carbon bisulphide for the disinfection of soils is being more and more widely counselled. In certain cases 176 lb. of carbon bisulphide may be quite sufficient for an acre, but as much as 3,344 lb. has been used. One ton per acre will not injure flowers or vegetables, but expense is a consideration. Light soils are most suited for this method, as in them the fumes spread easily and rapidly, and less bisulphide is required, 1 oz. at a depth of 4 inches being sufficient for a square yard, while in a compact soil 1¼ oz. is necessary. In soils that are too compact or too damp, the chemical is localised too long, and may thus burn plant roots and finally disperse without reaching the noxious organisms. The holes made in such soils should be prepared for the bisulphide by a special boring nozzle fitted on the injector, more of the chemical being required the deeper the holes. The depth should be a little greater than that at which the pest is found, whenever it is possible to locate it. In light, permeable, sandy soils 193 lb. per acre has been used; in alluvial soil, 20 to 24 inches deep, 264 lb. per acre; in gravel and stony soil, 12 to 14 inches deep, an average of 193 lb. per acre. Against *Phylloxera* half oz. to about 2 oz. per square yard have been used; against rot (pourridié) about 7 oz. per square yard, according to Dufour, and about 2½ oz. according to Foëx. In Germany and Holland good results have been attained against the nematodes of the beet with 6 oz. per square yard; but in France 10 oz. and more have been recommended. Against white grubs 7 oz. per square yard are used. Only the cultivation of flowers and early vegetables can stand the high cost of the large doses to which practice appears to be tending. Thus, 7 to 8 oz. may be injected when dealing with mole crickets injuring cuttings of carnations in boxes. Twenty-five holes per square yard, each taking about one-third oz. are required in this case, which may be considered as a maximum; for in many instances 3 to 4 oz. are sufficient. If, as is advisable, the operation is repeated at a week's or a fortnight's interval, the 8 oz. dose may be reduced to about 6 oz. On unplanted soil the application of carbon bisulphide is carried out, either in spring or in autumn, a little before sowing or planting. The soil must have settled and must not be too damp, as then the development of gas will be imperfect, or the water will wash the chemical down into the earth where it will be useless. Dry and temperate weather is the best; hot weather hastens the production of gas. When dealing with planted areas it is well to wait, if a severe frost is expected, as the evaporation of the bisulphide cools the earth. It is generally stated that sowing or planting should be done some 15 or 20 days after treatment and a little nitrate of soda added when the young growths are able to profit by it. However, tomato plants do

not appear to have suffered though planted two days after 7 oz. of bisulphide had been injected in the square yard. Care must be taken not to operate when the trees are in blossom or when the fruits are nearly ripe. E. Wolny states that the introduction of carbon bisulphide into cultivated soil has the effect of either completely or temporarily arresting vegetation and diminishing the production of vegetable matter. It is, therefore, necessary to keep it at a certain distance from the roots. It is said that both plants and pests were destroyed by an injection of 10 oz. per square yard against the nematodes of the beet. Against this, salads are stated to have been scarcely withered at all by a dose of 3 oz., and growing carnations did not suffer from a 7 oz. to 13 oz. dose. It may be accepted that young plants are generally more sensitive. Gastine's injector (pal injecteur) is the instrument used for piercing the holes and injecting the bisulphide. One stroke of the piston rod injects about one-third fluid ounce, which is measured by the d ameter of the pump chamber and the stroke of the piston. By packing in suitable disks the stroke is reduced and doses of four-fifths, three-fifths and two-fifths of the above are obtainable. In all cases about one-tenth of the full one-third fluid ounce remains in the chamber and this must be allowed for by adjusting the capacity to take that amount extra. When the operator is alone he withdraws the instrument and quickly closes the hole with his foot. It is, however, advisable for him to have an assistant to close the hole with a suitable instrument. For large areas a plough, such as that of Vernette of Béziers, is used. The character of the soil not only governs the quantity of bisulphide, but also the number of the holes. These may be comparatively few and far between in the case of light soils in which diffusion is easy. The converse obtains in compact soils, and double the number of holes may be necessary for the same quantity of bisulphide. In dealing with *Phylloxera* four holes, at a distance of about 12 inches from each other, give good results. One man operating alone is able to make 1,000 holes per day, and 3,400 holes may be made if he has an assistant. On the basis of five holes per square yard some 20,000 holes are required per acre and if a man can make about 1,360 holes per day on an average, the acre will require 14 days. Taking wages at about 3*s.* per day, this works out at about £2 per acre for labour. With 8 cwt. of carbon bisulphide per acre at 22*s.* per cwt., the cost per acre works out at about £9 per acre for bisulphide. At the present time the price of bisulphide is higher. The author mentions that for small areas, such as gardens, gelatine capsules containing 2, 3, or more grammes of the chemical may be applied. A pointed stick forms an efficient tool. The mixture of carbon bisulphide fumes with atmospheric air forms a dangerous detonating compound and workmen must not smoke. Flinty soils may cause sparks to fly when the tool is driven in, which is a source of danger. The barrels containing the bisulphide are best stored in an open field with proper protection against the sun. When drawing out some of the liquid it is well to pour in a little water, as this prevents the space left empty from filling with fumes. A greased sounding rod will serve to show how much of the liquid remains in the container, as the grease will be dissolved where wetted by the bisulphide. Empty containers must be left open for a couple of days to permit all traces of bisulphide to evaporate before the bungs are replaced.

WOLFF (M.). **Der Kiefernspanner** (*Bupalus piniarius*, **L.**).—*Beiheft zur Zeits. für Forst- und Jagdwesen, Berlin*, 1913, pp. 1-290, 7 pl. 7 figs.

The present work is a detailed monograph on *Bupalus piniarius*, L., the most dreaded of pine moths, written particularly from the point of view of economic forestry, with accounts of the damage it causes, and various methods adopted to combat it. The first part of the work deals entirely with the biology of the moth and contains descriptions of the various stages in its life-history, accounts of experiments and observations made to ascertain the number of eggs laid, the period of development, the proportion of males and females hatching out in different localities, etc., and a discussion of the nomenclature of the species. A chapter deals at some length with the geographical distribution of the species at former times and at present, and an account is given of the conditions which now appear essential to its existence. Species related to *B. piniarius* are referred to, but a detailed account of their life-histories and habits is being kept for a later work. An historical summary is given of the damage that has been reported from various localities since the first time the insect was observed in 1780 to the present day; the pathological effect upon the tree is also discussed. Parasites of the moth are mentioned, but no indication is given of their efficiency in keeping the pest under control. Various methods of combat are discussed, such as collecting the moths, trapping them by illuminants, the use of bird-lime, treating the ground in which the pupae are developing with soap solution, etc.: but these are all regarded by the author as either too costly or inadequate. The method recommended is the raking of the ground below the trees to expose the pupae to dessication and to birds: the soil, consisting chiefly of pine-needles, must be thoroughly well turned over, either with very strong rakes or by means of patent machines described and figured by the author. The book is well illustrated.

ROSSIKOV (K. N.). **Простѣйшій способъ уничтоженія Озимаго Червя или Бабочекъ озимыхъ совокъ.** [The simplest method for the destruction of the caterpillars or moths of *Euxoa segetum*, Schiff., and *Feltia exclamationis*, L.]—**«Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. З. и З.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture,*] *St. Petersburg*, x, no. 8, 1914, 11 pp.

The author starts with a short record of the outbreaks of these pests during the last few years in parts of Russia which appear to have been previously free from them. In the government of St. Petersburg there was an outbreak about 40 to 50 years ago, and then again last year (1913), when the insects invaded the neighbouring governments of Novgorod, Olonezk, and Pskov; they also devastated the crops in some parts of Siberia, where the author inspected the havoc done by them in the government of Enisseisk and in the provinces of Akmolinsk and Semipalatinsk in 1911 and 1912. He then refers to the principal remedies, dividing them into (1) preventive remedies, such as bare-fallowing the fields and doing away with all strips of waste land; (2) destructive remedies, such as catching the moths on fermen-

ting molasses and using insecticides (Schweinfurt green) against the caterpillars; and (3) protective remedies—trenches with straight walls and about 7 inches deep round the unattacked crops. To these he adds another preventive remedy which has been investigated by him in 1913 and gave better results than bare fallow; this he calls "occupied fallow" (a note announces that a special pamphlet will be published on the subject). These remedies are applied in Russia only on large estates and chiefly in the south-western governments; in all other parts of Russia they are seldom used, owing to lack of means and to the fact that it is not practicable to leave land fallow under the existing conditions of agriculture. The author has satisfied himself that these insects can be successfully controlled by the simple method of collecting the moths by hand. He observed that during the time when the moths of *E. segetum* and *F. exclamationis* were on the wing, and especially during their maximum period between the 10th and 21st July, they congregated every evening between 9.30 and 10.30 p.m. on rye plants, being almost entirely confined to the edges of the fields and principally where these adjoined fallow-land; the strip of the rye upon which the moths occurred was not broader than 3½ feet. The females appear first and sit motionless, while the males arrive somewhat later and are more active; the females could be examined by the light of an acetylene lantern and even touched with the hands without any resistance on their part. Seeing that each female may lay up to 1500 eggs, the collection of the moths may have important practical results.

The author concludes by mentioning some other pests which can also be easily collected by hand at the same time: *Barathra (Mamestra) brassicae, Acronycta psi, A. rumicis, Trachea (Hadena) basilinea, Euxoa corticea, E. nigricans, Plusia gamma* and others.

Dobrodeev (A. I.). **Дымъ вообще и табачный дымъ въ частности, какъ средство борьбы съ яблонной медяницей.** [Smoke generally and Tobacco-Smoke in particular as a remedy against *Psylla mali*.] — **«Труды Бюро по Энтомологiи Ученаго Комитета Глав. Управ. З. и З.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture,*] *St. Petersburg*, x, no. 9, 1914, 20 pp.

The author gives an account of his experiments on the fighting of *Psylla mali* by means of tobacco-smoke and smoke from burning straw, which were conducted in an orchard in the government of Penza. He starts with a general review of the life-history of the pest and of the remedies usually employed. Portchinsky and Gaike have both simultaneously recorded the favourable results which may be obtained by using tobacco smoke, and the author has himself shown this remedy to be very successful, both in the field and in the laboratory, but the following conditions must be adhered to. The fumigating must be done at the time when the pests are on the wing, but before they have oviposited; the smoke must closely fill the whole tree for at least for one hour; the fumigating must be started along the borders of the orchard, so as to prevent the escape of the insects; it must be done in calm weather, after rain, as dry air allows the smoke to rise rapidly without affecting all parts of the tree; care must be taken

that there should be no branches hanging directly over the burning heaps. Straw smoke proved less effective and can be recommended only as a means of driving away the pests; this may be useful only in cases where there are in the neighbourhood of the particular orchard some other trees (apple or Sorbus) on which the insects can oviposit, otherwise they may merely return after the fumigation is over.

The author deals also with tobacco smoke as a remedy against *Psylla* and Aphids, and refers to statements of Professor Glasenapp, F. V. Theobald and others. The use of this remedy in Russia may be affected by the price of tobacco dust, which varies in different governments, depending on freight rates and other conditions. He quotes a few examples of prices, and it appears that while, for instance, the price of tobacco dust in the government of Saratov is about 7½d. per 36 lb., in the government of Kaluga it is about 1s. 3d. for the same amount, and in the government of Penza about 10d. Should the price, and especially the railway freight, be reduced, it may take a prominent part as an insecticide in Russia.

VASSILIEV (I. V.) **Краткія свѣдѣнія о хлѣбномъ жукѣ и способы борьбы съ нимъ.** [Short notes on *Anisoplia austriaca*, Herbst, and methods of fighting it.] **«Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. З. и З.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture.*] *St. Petersburg*, vii, no. 2. Second, enlarged edition, 1914, 36 pp., 20 figs., 2 col. plates.

The author begins by describing all the stages of *A. austriaca*, which is the most injurious representative of the genus *Anisoplia*. This insect is found in the greater part of the southern half of the "tchernosiom" district of Russia and a list is given of the governments in which it is known. Outside Russia it is found in Austria-Hungary, in the Balkan peninsula, in Syria and in Asia Minor. Upon the emergence of the beetles in spring their food consists at first of various grasses, such as *Triticum repens* and *Phleum pratense*, from which they pass on to rye, and after this has been harvested, to winter wheat and barley and lastly to summer wheat, on which they remain till their disappearance in the first half of August. For oviposition the insects select soft soil, and usually keep round the borders of the field, while the central part is sometimes not affected at all. The number of eggs laid by a female is on the average 30–40, although Jaroshevsky reports that under favourable conditions a female may lay up to 48 eggs, which figure is, according to the author's observations, sometimes increased to 58. The larvae live in the soil for about 22 months, and the pupal stage lasts about three weeks. The beetle itself attacks chiefly rye, wheat and barley at the time when the grain is still soft, gnawing the seeds and sometimes devouring them entirely. Moreover, it causes much loss by creeping over the ears and shaking out the mature grain.

The whole cycle of development of *A. austriaca* requires two years, the imago appearing in large numbers in alternate years; so that outbreaks, which are due to some specially favourable conditions, recur after an even number of years.

There are three species of parasitic wasps of the family SCOLIIDAE which attack the larvae of this beetle: *Tiphia femorata*, F., *T. morio*, F., and *Scolia quadripunctata*, F.

Tiphia femorata, of which the various stages are described, attacks exclusively the large one-year-old larvae of the *Anisoplia*, in search of which it penetrates into the soil. The parasite paralyses the larva with its sting, and then deposits its egg on the ventral side of the central segments of the body. This egg produces a larva in about a week, which feeds on its host externally. The development of the parasitic larva is concluded in about 1½–2 weeks, when it enters the hollow skin of its victim and pupates there, passing the winter in this stage. The number of larvae infected by this parasite is not great, about 6–12 per cent. according to some investigations by Portchinsky in 1879; in 1905, the author found 14 per cent. of the larvae affected in some spots, but the figure never exceeded 20 per cent. The same insect parasitises also the larvae of *Amphimallus solstitialis*, *Polyphylla fullo*, *Epicometis hirtella* and insects of the genus *Aphodius*. The habits of *Tiphia morio*, which parasitises *A. austriaca* and *Amphimallus solstitialis*, are similar to that of *T. femorata*. According to Wiedhalm *T. morio* produces two generations during one summer while Rossikov is of opinion that the same may be the case also with *T. femorata*.

Scolia quadripunctata has been recorded by Portchinsky as a parasite of *A. austriaca*, and also parasitises *Oxythyrea stictica*, but its biology has not yet been investigated. Apart from the above parasites, the larvae of *A. austriaca* are also attacked by the larvae of *Microphthalma disjuncta*, Wied., a Tachinid fly of the subfamily DEXINAE, which destroy chiefly the larvae of *Melolontha hippocastani*, *Amphimallus solstitialis* and *Polyphylla fullo*. A description is given of the various stages of this fly, which has two generations in South Russia, the second one hibernating in its larval stage inside the body of the host. According to Krassiltchik this parasite develops very rapidly and devours the host in a few days.

The larvae of *A. austriaca* are subject to the attacks of a nematode worm, *Leptodera dentata*, and also become infected with flacherie and a fungus disease due to *Entomophthora anisopliae*. In 1902, near Kishinev, this disease caused the death of 60–70 per cent. of the larvae of *A. austriaca*.

The author proceeds to deal with control measures against *Anisoplia*, describing first the digging operations which must be conducted in order to estimate the intensity of infestation. These must be carried out during the second half of the summer, after the harvest, till late in autumn, when the frosts begin. The digging ought to be done in plots which were occupied during the summer by grain crops, especially by wheat and rye; also in fields left fallow during the previous season, which have been ploughed up for crops other than grain; and neighbouring meadows and other soft soil should also be investigated. The operations can be limited to a strip of some 25–35 yards round the fields, the procedure being to dig holes of a standard size in various spots and then to estimate the total number of larvae in the contained soil, as well as the numbers of those that are diseased, or suffering from parasites, etc. The results obtained by these investigations ought to be checked by renewed investigations in the following spring.

in order to find out the progress of diseases, etc., during the winter. Should these investigations prove that an outbreak may be expected, the preventive measures recommended are, to decrease the area of crops, such as wheat, barley, and especially summer wheat, and to harvest the grain as early as possible. As the insects attack principally the edges of a crop, it is suggested that the fields be made square, rather than long parallelograms, in order to reduce the length of the margin to a minimum.

The following destructive remedies are suggested:—Trap crops of wheat and rye, and also maize, the soil under which is preferred by the pests for oviposition. These fields must be sown before the outbreak has really started, and the beetles which concentrate on them can be collected by hand, while the eggs can be destroyed later by reploughing. Reploughing is also recommended for the destruction of pupae, in spots where investigations have shown the presence of large numbers of larvae. As pupation takes place after May, the ploughing must not be done before the middle of that month, but it must be finished by the first half of June. The insects may also be driven to one side of the field by drawing heavy ropes across it, and they can then be collected into sacks and destroyed. This must be done at the hottest time of the day, when the beetles are more easily driven down the wind; if there is no wind or if the wind is too strong, this remedy becomes impracticable.

In South and Middle Russia there are additional species of *Anisoplia*, such as *A. cyathigera*, Scop., *A. segetum*, Herbst, and others which are less injurious. *A. cyathigera* occurs over a larger area than *A. austriaca*, being found as far north as the governments of Tula and Kazan; while *A. segetum* ranges from the government of Kurland in the west to the government of Simbirsk in the east. They usually appear earlier than *A. austriaca*. *A. cyathigera* injures grain in the same manner as the latter species, and as its habits are similar, the remedies recommended may prove effective against this pest as well. The damage done by *A. segetum* is not very serious, consisting chiefly in the destruction of the inflorescence of the grain. It disappears from the field sometimes even before the end of July.

A synoptical table to facilitate the identification of the various species of *Anisoplia*, another giving the distinctive characters of the commoner Lamellicorn larvae found in the soil, and two coloured plates, are appended.

RABINOVICH (A.). **Простое средство противъ ленки.** [A simple remedy against *Epicometis hirtella*, L.]—**« Прогрессивное Садоводство и Огородничество.»** [*Progressive Horticulture and Market-Gardening.*] *St. Petersburg*, no. 5, 15th Feb. 1914, pp. 137-138.

The author gives an account of a remedy against *Epicometis hirtella*, L. (*Tropinota hirta*, Poda) which he has successfully applied during the last 8–10 years and by means of which he has been able to keep the insect entirely under control. The remedy consists in spraying lilac bushes, which are found in nearly every garden and which blossom at a later date than fruit trees. The insects, after the blossoming of the apple trees is over, pass on to the lilac, on which they feed very freely, and by spraying these bushes at the time of their blossoming

with Paris green or Djipsin of a double strength it is possible to destroy practically all of them, except those which arrive later from neighbouring gardens where no remedies are used, or from the open fields.

VASSILIEV (Eug. M). **Дополненіе (I-ое) къ „Списку животныхъ вредителей люцерны."** [First supplement to "The List of Animal Pests of Lucerne."] **«Хозяйство»** [*Agriculture*], *Kiev*, no. 6, 26th Feb. 1914, pp. 189-193. (From the Myco-Entomological Experimental Station of the All-Russian Society of Sugar-Refiners in Smiela, Govt. of Kiev.)

For the original list, to which this is supplement, see this *Review*, Ser. A. i, p. 526. The following species are now added.

COLEOPTERA: The sprouts of lucerne are injured by larvae of *Leptosonyx typhoides*, Dalm., a Chrysomelid. An outbreak occurred in the government of Astrachan in 1912, where the larvae also damaged vetches, lentils and wild steppe plants. The insect is known only from South Russia and has been very little studied. *Plagionotus (Clytus) floralis*, Pall., this Longicorn has been recorded by Paczoski as a pest of lucerne in some parts of the government of Taurida. *Hypera (Phytonomus) denominanda*, Cap., although known in Austria-Hungary, Germany, Turkey and Caucasia, is not reported as injurious, but according to Demokidov it injures the leaves of lucerne in Turkestan (1906). The following information is supplied by this author: the weevils winter on the surface of the earth among the upper roots of lucerne or under dry grass; early in spring they feed on the leaves and oviposit on the plant; the larva gnaws long holes in the leaves and after 3-4 weeks pupates on a folded leaf in a white transparent cocoon; in about 4-5 days the beetle emerges, and lives for some time on the lucerne before hibernating. *Calosoma* and its larvae and some parasites are mentioned as enemies of this pest. The following remedies are suggested: spraying in spring with Schweinfurt green (4·8 - 6 drams of green and double this amount of freshly slacked lime in about 2·7 gallons of water), or with barium chloride (4·5 - 7 oz. in 2·7 gallons of water); dusting with a powder of freshly slacked lime (after rain or dew) by means of "Torpille" bellows; and the early cutting of lucerne as a means of destroying the larvae as well as the eggs.

HOMOPTERA: *Acocephalus rusticus*, F., is reported by Paczoski to have injured lucerne in the government of Cherson in 1913.

LEPIDOPTERA: *Chloridea obsoleta*, F., was reported in 1911 from Turkestan, where its caterpillars injured the leaves of lucerne, cotton seeds, maize, and tomatoes. *Laphygma exigua*, Hb., also reported in 1911 as attacking lucerne in Turkestan. In the same year the caterpillars of this pest appeared in the government of Astrachan on lucerne, but they were not noticed again in 1912. *Eubolia arenacearia*, Hb., also reported in 1911 as attacking lucerne in Turkestan. In the same year the caterpillars of this pest appeared in the government of Astrachan on lucerne, but they were not noticed again in 1912.

DIPTERA: *Perrisia onobruchidis*, Bremi; the author refers to Prof. Kirchner, who mentions this Cecidomyid amongst the pests of lucerne in the first edition of his book, although it is omitted in the

second. According to Keppen, this pest was reported from the government of Charkov in 1882 on sainfoin crops, having been identified by Portchinsky; besides sainfoin, the larvae attacked lucerne (*Medicago falcata*), *Melilotus officinalis*, Desr., *M. macrorrhizus*, Pers., and *M. albus*, L.

SCHERBAKOV (Th.). **О паразитахъ-яйцеѣдахъ плодожорки и о работахъ надъ ними А. Радецкаго.** [On the parasites of the eggs of *Cydia pomonella* and the investigation of them by A. Radetzky.]—Reprint from **Записки Симферопольскаго Отдѣла Императ. Росс. Общ. Садоводства.** [*Memoirs of the Simferopol Branch of the Imperial Russian Society of Horticulture*], *Simferopol*, no. 140, 1914, 12 pp.

The author refers to the papers by A. Radetzky on his importation of the parasites of the eggs of *Cydia* (*Carpocapsa*) *pomonella* from Astrachan to Turkestan, and points out that at the First Russian Conference of Entomologists in Kiev, in August of last year (1913), the work of Radetzky was severely criticised. The latter stated that he had imported into Turkestan the parasite known as *Trichogramma* (*Oophthora, Pentathron*) *semblidis*, Auriv., but owing to some doubts as to the exact identification of the parasites found in that country, he gave to it the name of *Trichogramma* (*Pentarthron*) *carpocapsae*, Ashm. When he sent his specimens to Russia, the Russian entomologists were not able to discover amongst them either of these two species, but identified them as *Trichogramma fasciatum*, Perkins. Thus the exact name of the parasite and the number of species imported by Radetzky is not known, though this is a matter of great importance, so far as their usefulness, etc., is concerned. The author further doubts the statement of Radetzky that there are no local species parasitic on *C. pomonella* in Turkestan, for a species has been found by Plotnikov in Fergana, where no parasites have been imported; nor does he accept the contention that *C. pomonella* was absent from Turkestan till it was imported by the Russians after the conquest.

FINOV (A.). **Отчетъ о дѣятельности Калужскаго Энтомологическаго Бюро за 1913 годъ.** [Report on the work of the Entomological Bureau of the Zemstvo of Kaluga for the year 1913], *Kaluga*, 1913, 36 pp.

The Entomological Bureau in Kaluga came into existence at the beginning of last summer and this is a report on the first half-year's work. Attention has principally been paid to pests of orchards, as these constitute an important industry in the government, covering nearly 16,200 acres. Most of these orchards are in a very unsatisfactory state, and the Bureau had to undertake the task of teaching the population the necessity for proper cultural methods, as well as measures for controlling the various insect pests, which have yearly levied a heavy toll. The report goes on to describe the campaign conducted by its staff on two areas, one in the district of Mestchovsk and the other in the district of Kozelsk.

Aporia crataegi, L. The larvae of this butterfly started emerging from their winter nests in the first half of April and attacked the young buds. The destruction of the nests, cleansing of the stems and the

application of tanglefoot belts were immediately initiated; belts were put on 7,000 trees in one district and on 3,500 trees in the other. Before the blossoming of the trees spraying was proceeded with and a total of 24,300 acres in both localities was sprayed with Paris green. After the 21st May the first pupae appeared, which gave a new generation from the 2nd June, but the number of butterflies on the wing was not great. The first eggs were found on the 17th June, the caterpillars emerged after the 6th July, while after the 25th August the first winter nests were noticed. The results of the campaign are considered satisfactory and only those orchards suffered great damage the proprietors of which applied no remedies, these being stripped quite bare of leaves. In all the other orchards the harvest was small, and sometimes bad, but the trees produced leaves.

Psylla mali, Först. The hatching of the larvae started on the 19th April and on the 23rd they were already inside the buds, which later on were entirely covered with the pests. The imagos appeared on the 23rd May, and large numbers of eggs could be found at the end of August. The usual remedy of spraying with quassia and green soap was applied, but owing to the large area to be treated this remedy could not be completed in time, i.e., before the larvae entered the buds. If applied in time it gave excellent results. The spraying with insecticides in old orchards was rendered ineffective owing to the close planting of the trees, coupled with their thick crowns. Fumigating with tobacco was also applied during the time when the insects were on the wing for two to three months from the end of May which always gave excellent results. The only drawback to this remedy is that it destroys the pests after they have already caused much damage in their larval stage, but it frees the orchards from them for the next year.

Aphis pomi, de G., was found in young orchards (5-8 years old) and in nurseries. Spraying with quassia was very effective. The hatching of the lice started on the 21st April; the first nymphs were noticed about a fortnight afterwards; the first winged specimens appeared on the 17th May; in the first half of September plenty of eggs were found. *Aphis sorbi* Kalt. was found in both localities.

Anthonomus pomorum, L., was found in orchards everywhere, but owing to the feeble blossoming of the trees its injurious activity was not great. The hibernating weevils appeared after the 11th April; larvae were found in the buds after the 12th May they pupated from the 26th May and produced imagines from the 17th June. A table showing the results of shaking the insects from the trees is given, from which it appears that 211 beetles were obtained in this way from 33 apple trees; on the same trees 73 beetles were collected on the sticky belts. Spraying with lime in the orchards, where the short spring allowed of this remedy, proved successful.

Cydia pomonella, L., was observed in every bearing orchard. The caterpillars of *Malacosoma neustria*, L., appeared only in small numbers and no special remedies were applied. Nests of *Hyponomeuta malinellus*, Z., to the number of from 2 to 5 were noticed on trees from the first half of June to the beginning of July. The insects were found everywhere, but not in great numbers. *Euproctis chrysorrhoea* was seldom found.

The report further refers to the spraying of the trees with sulphate of iron, which had for its object the removal of the moss, lichen, etc., and gives a general review of the results of the campaign. The pests mentioned above were found also in other parts of the government outside the two districts specially dealt with. From the town of Kaluga *Byturus tomentosus*, F., and *Cossus cossus*, L., were reported. The caterpillars of the latter were found in poplar trees between the 11th August and the 19th September; the first pupation took place on the 23rd August.

As to the pests of field crops, chief amongst them were *Agriotes lineatus*, L., and *Euxoa segetum*, Schiff. The larvae of *A. lineatus* caused great injury to some fields in the district of Kozelsk, during the autumn of 1912. Investigation conducted on the same fields in April 1913 again showed their presence. In order to ascertain the degree of the infestation samples of the soil were taken out and carefully examined by screening, the soil having previously being made friable; for each sample a clod of earth about 1½ feet square and about 10½ inches thick was dug out from each dessiatine (2·7 acres); these samples showed an average presence of 20,000 larvae per acre. Two kinds of remedies were tried; potato baits poisoned with Schweinfurt green, and suffocating with carbon bisulphide (CS_2). The first experiment was conducted in the following way: slices of potatoes were put into a solution of 1 per cent. Schweinfurt green in sal ammoniac and left there for about 24 hours; the potatoes were then left in the open air till the smell of ammonia was lost, after which they were set in trap holes of about 8 inches square and 9 inches deep, which were covered with boards. Such holes were dug at a distance of 20 paces one from another round the attacked spots. Only a few specimens of dead larvae were discovered later in these traps, but in the soil round them more larvae, motionless, and of a peculiar blueish brown colour were found; of 48 such larvae which were put into a glass with earth and food, 32 perished in about 10 days, *i.e.* 66⅔ per cent. Evidently the larvae had left the holes after having eaten the poisoned baits. Details are given of an experiment with carbon bisulphide; but the percentage of larvae killed was only 32·1 per cent. and 38·3 per cent. Owing to the cost of this remedy it is not considered possible to increase the amount of CS_2, but evidently the time during which it remained in the earth was not sufficient to permit of complete diffusion in that particular soil.

Agriotes larvae also injured various winter-sown fields in September. A part of one field manured with superphosphate was injured, while a neighbouring part manured with basic slag was not attacked by the pests. According to the proprietor of the field, the larvae last year also attacked a part manured with basic slag, when the latter was scattered about the field; while this year the method of manuring was to lay the slag in regular lines. As a rule, crops manured during the summer with dung were able to withstand the attacks of the wireworms, although there were large larvae in the earth of such fields; evidently the dung caused a strong and rapid growth of the plants. It is also reported that on one field, part of which was sown with grain (rye) disinfected with formalin, owing to its suffering from a fungus disease (*Tilletia secalis*, Kuhn), the crop was very heavy; while on the other part, where no such process was applied to the sown grain

the plants were injured by the larvae. The author is not incli[ned] to explain this as due to the influence of the formalin alone.

Experiments conducted in the laboratory on the food of the [larvae] showed that they preferred cucumbers, beetroots and carrots; the next place being taken by potatoes, while they ate turnips [very] unwillingly and did not touch radish. Cannibalism was also observed.

Euxoa segetum was present in the government, but not to a [serious] extent. The following species are also recorded: *Feltia* (*Agrotis*) *exclamationis*, L., *Ochsenheimeria taurella*, Schiff., an unidentified species of Thrips, *Siphonophora cerealis*, Kalt., *Phyllotreta* [*vittula*], Redt., and *Athous niger*, L.

DINDON (P.). **Къ борьбѣ съ капустной мухой.** [On the fight against *Chortophila* (*Anthomyia*) *brassicae*.]—**«Садоводъ»** [*The Horticulturist*], *Rostov-on-Don*, no. 2, Feb. 1914, pp. 111-113, 2 figs.

The author gives some information as to the life-history of the fly. The larvae attack the young stalk and collar of cabbages, causing the plants to fall over. The imago appears early in spring and oviposits on the stalks of the plants, near the earth, the eggs hatching in about ten days. The larvae pupate in the earth and produce a second generation in June-July. The duration of the whole development of the insect is about 1½–2 months, so that they can produce two to three generations during one summer. The females prefer to oviposit on dung, so that plants manured with poudrette or fresh dung or similar manure are more liable to attack, while the damage done by the pest is less in fields manured with compost or some other artificial manure. The most radical remedy is to take out the injured plants and to destroy them, together with the larvae, by burning. As a preventive measure the author suggests spraying the plants with milk of lime (1–2 lb. lime in about 2·7 gallons of water), but this remedy is effective only for a short time. Good results can also be obtained by rubbing the collar of the plants between the fingers, which operation prevents the hatching out of the larvae, this must be repeated every ten days and at the same time the earth round the plants must be sprayed with milk of lime or simply with dry lime (about 1 cwt. to the acre). The author records the results of the following method applied to two fields of cabbage during last year. Both fields were manured only with mineral manure, such as basic slag, potash, etc., besides having been limed in the previous autumn. The first field was also twice reploughed during the autumn and twice harrowed in the following spring. The second field was only once reploughed in autumn. The rubbing of the stalks was only once undertaken and no liming was applied afterwards. The results were that on the first field only 5–8 per cent. of the plants fell out, whilst on the second one this figure reached 20 per cent.

STCHERBAKOV (Th.). **Замѣтки по фаунѣ уховертокъ, трипсовъ и сѣтчатокрылыхъ Россійской Имперіи.** [Notes on the Dermaptera, Thysanoptera and Neuroptera of the Russian Empire.]—*Revue Russe d'Entomologie, St. Petersburg*, xiii, no. 3-4, 1913, pp. 461-466.

The following species of Thysanoptera are recorded by the author

Haplothrips aculeatus, F., *Aeolothrips fasciatus*, L., and *Limothrips denticornis*, Hal., found in 1912 on tobacco leaves in the government of Tchernigov by Miss A. Bragin. The author is of opinion that both species were swept by the wind on to the tobacco and perished on the sticky surface of the latter: he does not consider it in any way probable that they feed on tobacco. *Scolothrips sexmaculatus*, Pergande, found by F. Zaitzev near Tiflis in 1912. This is the first time that this species has been reported in Russia, as up till now it has been known only from the United States, according to Moulton and Qualey: it is probable that it has been imported into Russia from the cotton plantations of North America. *Physothrips atratus*, Hal., and *Frankliniella tenuicornis*, Uz., found on tobacco in the government of Tchernigov in 1912 by Miss A. Bragin. *Drepanothrips viticola*, Mokrz., found by Mokrzecki in 1901 near Novorossiisk, is injurious to vines, causing red spots to appear on them. The females winter underneath the bark and appear on the leaves in April. *Heliothrips haemorrhoidalis*, Bouché found by Mokrzecki in 1912 on leaves of *Viburnum* sp. in Suchum, in the garden of the Experimental Station.

POSPIELOV (W.). **Versuche künstlicher Infizierung der Wintersaateule (*Agrotis segetum*, Schiff.) mit parasitischen Hymenopteren.** [Experiments on the artificial infection of *Agrotis segetum*, Schiff., with parasitic Hymenoptera.]—*Zeits. wissen. Insektenbiol., Berlin*, x, no. 2, 15th Feb. 1914, pp. 52-58.

This is practically a translation of the paper abstracted in this Review, Ser. A, i, p. 539.

FRIEDERICHS (K.). **Ueber *Adoretus vestitus* Boh. als Schädling in Samoa und seine früheren Stände.** [*Adoretus vestitus*, Boh., as a pest in Samoa, and its previous significance.]—*Zeits. wissen. Insektenbiol., Berlin*, x, no. 2, 15th Feb. 1914, pp. 41-47, 6 figs.

This *Adoretus* has been known for some time past in Samoa as the Rose Beetle, from its principal food-plant. Until recently it has not been regarded as a pest, but now it has taken to feeding on cacao, and its depredations may probably become serious. The author believes it to be also the cause of damage observed on Liberian coffee; species of the same genus are recognised pests of coffee and cacao in Java. The beetle hides during the day, and feeds at night, being attracted by light. It occurs all the year round. Little is known of its life-history, but it is surmised that breeding takes place at all times of the year, the larvae are always to be found among the roots of grasses or other plants; these larvae are not known to do any damage. It appears that the cacao trees most liable to be attacked are those which are unprotected by larger trees, and which stand more or less alone. Combating the beetle is a matter of some difficulty, mechanical and chemical methods which have been tried having proved of little use; in the case of spraying (nature of spray not stated), the beetle was destroyed, but the leaves of the plant were badly damaged. No natural enemies which would keep the beetle quite under control are known in the vicinity where the damage is done, but the author suggests that, were they introduced, the enemies which he has advocated for use against the rhinoceros beetle (*Oryctes rhinoceros*, L.)

would prove efficient. [See this *Review*, Ser. A, ii, p. 26.] As regards fungus diseases, infections with green muscardine have so far not been successful. A description of the species is given.

CHADWICK (C. J.). **White Ants on Coconuts.**—*Trop. Agric., Peradeniya*, xlii, no. 2. Feb. 1914, p, 96.

The author in reply to Mr. Krishnaswami Row, regarding the ravages caused by white ants in a young coconut plantation, suggests the use of a mixture of 1 lb. crude perchloride of mercury and 10 gallons of water, the soil surrounding the young palms to be saturated with this solution. This works satisfactorily in the case of a rubber plantation. It has been found that the best situation for a coconut plantation is near the sea or along the banks of a river where the soil is well drained and supplied with moisture throughout the year. According to Mr. W. W. Froggat a few pounds of kainit dug in about the roots of fruit trees will drive away white ants. [See this *Review*, Ser. A, i, p. 513.]

MARTELLI (G.) **Il *Tetranychus telarius*, L., provoca agli Agrumi la così detta Ruggia rossa.** [*Tetranychus telarius*, L., the cause of the so-called red rust on citrus trees.]—*Giorn. Agric. Merid., Messina*, vii, nos. 1-2, Jan.-Feb. 1914, pp. 7-10.

Many lime trees were almost completely defoliated in parts of the provinces of Messina and Catania during June and July, 1912. The upper side of the leaves showed yellow patches and the corresponding places on the under side were reddish. The fruit was spotted with brownish red. Among the growers this was known as red rust. The author states, as the result of careful experiments, that the injured leaves and fruit harbour *Tetranychus telarius*, L., and this mite is responsible for the discoloration.

MARTELLI (G.). **Sulla Bianca-rossa.** [Concerning *Chrysomphalus*.] *Giorn. Agric. Merid., Messina*, vii, nos. 1-2, Jan.-Feb. 1914. pp. 28-29.

In a reply to a correspondent the following data are given: (1) Six hundred large lime trees infested with *Chrysomphalus* require 70 pints of concentrated polysulphide (density 25° B.) 5 per cent. solution per tree per application, or 2,100 pints of concentrated polysulphide weighing 2,860 lb.; as three applications are necessary, the total weight would be 8,580 lb. (2) The number of applications may be reduced to two, with a corresponding reduction in the amount of insecticide, but in that case an operator must spray the top of the tree from a high ladder. (3) A single application of 20 per cent. solution in winter is not sufficient; two applications are required and they must be carried out as stated. Furthermore, the neighbouring plantations must be either clean or under similar control measures. The effects of the treatment will last for two years, if not longer, and no spraying will be required during that period.

GREEN (E. E.). **On some Coccid pests from the Seychelles.**—*Jl. Econ. Biol., London*, ix, no. 1, March 1914. pp. 47-48.

A small collection of insect pests, received from Mr. R. Dupont, Superintendent of Botanic Gardens, Seychelles, contained the following species of COCCIDAE:—*Aspidiotus ficus*, Ashm., taken on leaves of *Zamia* sp., an ornamental Cycad cultivated in tropical gardens; *A. bromeliae*, Newst., on leaves of the Pineapple, a serious pest, probably imported from the Canary Islands; *Coccus (Lecanium) hesperidum*, Auct., and *Eucalymnatus (L.) tessellatus*, Sign., on leaves of the Water Hyacinth; these insects may be regarded as beneficial, since the excessive growth of this plant blocks the waterways; *Saissetia (L.) hemisphaerica*, Targ., on leaves of *Justicia gendarussa*, an ornamental plant which seems particularly liable to Coccid infestation.

PICARD (F.). **Les champignons parasites des insectes et leur utilisation agricole.** [Fungi parasitic on insects, and their utilisation in agriculture.]—*Ann. Ecole Nat. d'Agric., Montpellier*, xiii, no. 2-3, 1914, pp. 121-248, 28 figs.

The present paper is a comprehensive account of the different species of fungi which are parasitic on insects; the author merely refers to those which live on insects either symbiotically or which only cause slight harm to them, and confines his descriptions to the species which are really detrimental to the host, and which may possibly be of use in agriculture in combating insect pests. The descriptions are written more from the point of view of the zoologist and agriculturist than from that of the mycologist. The species of fungi dealt with are arranged according to their systematic order. In the group of Oomycetes, the family ENTOMOPHTHORIDAE is the only one containing species harmful to insects, notably the genus *Empusa*. Of the Ascomycetes the following groups are described: Laboulbeniaceae, Spheriaceae, Nectriaceae, and Perisporiaceae; a large section of the paper deals with the important group of Hyphomycetes, which includes many species that kill insects.

Harmful parasitic fungi react on their hosts in various ways; in the case of the Laboulbeniaceae, the fungus gets its nourishment from the tegument of the host, without seriously damaging the body or injecting the toxic substances into the system of the host. Others, more harmful, pierce the chitin and destroy the layers of adipose tissue lying below. Still more harmful are those whose mycelium branches in the body of the host, filling up the tracheae and causing suffocation, as does *Fusarium* in the case of certain *Acaridae*. The ENTOMOPHTHORIDAE and VERTICILLIACEAE kill their hosts by sending out filaments which penetrate all the tissues, destroying these and replacing them with a secretion, so that the insect becomes mummified; muscardine diseases work in this way. Sometimes the body of the host is entirely disintegrated, as is the case with Coccids parasitised by the Ascomycete *Myriangium duriei*. The modes of infection and the degrees of virulence of the diseases are discussed at some length, and a comprehensive bibliography is given.

A section of the paper deals with the economic significance of fungi as killers of insects. The accounts of experiments given show that

attempts to combat pests by the introduction of fungus diseases have so far not been very successful; and the author appears to think that while these diseases can be artificially increased where they already exist, yet it is not likely that they can be established in places where they do not occur naturally.

NOEL (P.) **Les Insects et les Acariens nuisibles aux plantes cultivées en France.** [*Insects and mites harmful to cultivated plants in France.*]—*Bull. Trim. Lab. Rég. d'Entom. Agric. Seine-Infér., Rouen*, Jan.-March, 1914, pp. 3-11.

The writer gives tables showing the particular orders of insects and the number of species attacking each of the 286 cultivated plants of France. The 16 cultivated fruit trees are attacked by 1,671 different kinds of insects; 28 market garden plants by 704 species; 31 forage plants and cereals by 988 species, and so forth.

NOEL (P.). **Les Ennemis des Salsifs.** [Enemies of salsify.]—*Bull. Trim. Lab. Rég. d'Entom. Agric., Seine-Infér., Rouen*, Jan.-March 1914, pp. 11-12.

The following insects are given as the chief pests of salsify: *Cassida thoracica*, Klug; *Aphis papaveris*, F., which sucks the juice of the leaves in June; *Aulax scorzonerae*, Giraud; *Scotogramma trifolii*, Rott. (*Mamestra chenopodii*, Schiff.), the caterpillars of which destroy the leaves from July to October; and a Cecidomyid.

AULMANN (G.). **Ein neuer Schädling an Kokospalmen auf Samoa.** [A new pest of coconut palms in Samoa.]—*Entom. Rundschau, Berlin*, xxxi, no. 5, 14th March 1914, pp. 31-32, 3 figs.

A new Hispid beetle is described under the name of *Promecotheca lindingeri*, Aulm., as a pest of coconut palms in Samoa. The eggs are deposited on the under side of the leaf, and the larvae make long mines in the parenchyma, causing the leaf to die. The damage done by the imago is quite different; it settles on the upper surface of the leaf and eats away the tissues from the outside in parallel lines, which also kills the leaf.

LYLE (G. T.) **Contributions to our knowledge of the British** *Braconidae*. **No. 1.** *Meteoridae.—Entomologist, London*, xlvii, Mar. 1914, pp. 73-77, 1 pl.

During the past ten years the author has given considerable attention to the study of hymenopterous parasites, their breeding habits and life-histories. The present paper, which is the first of a series describing the results of this work, deals with the British species of the METEORINAE: the British species of this family are all referable to the genus *Meteorus*, of which six species are described. *M. albiditarsis* was bred from a larva of *Taeniocampa miniosa*, and also from larvae of *T. gracilis*, *T. pulverulenta*, *T. stabilis*, and *Panolis piniperda*. *M. chrysophthalmus* was bred from larvae of GEOMETRIDAE. *M. ictericus* was bred from larvae of Tortrices, taken from oak trees. *M. atrator* was captured, together with specimens of the hyperparasite *Hemiteles areator*, running about on furniture which was infested with the moth *Tinea bisselliella*, evidently searching for the lepidopteron.

THEOBALD (F. V.). **Additions to the list of Kent** *Aphididae.*—*Entomologist, London*, xlvii, Mar. 1914, pp. 100-104.

A list is given of Aphides not previously recorded for Kent, including a few new to British fauna; the list includes 12 genera and about 50 species. The most abundant and harmful species in 1913 was *Aphis sorbi*, which did great damage to the apple crop; next in importance was *A. abietina*, on spruces, causing in many cases complete defoliation.

FELT (E. P.). *Diadiplosis coccidivora*, **sp. n.**—*Entomologist, London*, xlvii, Mar. 1914, pp. 86.

A description is given of a new species of midge, *Diadiplosis coccidivora*, reared in some numbers from a species of *Pseudococcus* by A. Rutherford in Ceylon. It appears to be related to *D. cocci* which preys upon the eggs of the black scale, *Saissetia nigra*, though differences may be great enough to warrant placing it in a separate genus.

HOWLETT (F. M.). **A trap for Thrips.**—*Jl. Econ. Biol., London*, ix, no. 1, Mar. 1914, pp. 21-23.

The author gives the results of experiments made to test the degree of attraction of certain chemical substances for flower-haunting insects. Three of the substances tried were found to have a marked attraction for Thrips, namely benzaldehyde, cinnamylaldehyde, and anisaldehyde. The two latter can be bought for 8s.-10s. per lb., but benzaldehyde costs under 2s. per lb.; taking the same quantities as were used in the experiments, 1 lb. is enough for about 200 traps, which retain their efficiency for at least a week. To prevent possible oxidation of the aldehyde, a trace of formaldehyde may be added. In the experiment traps two species of Thrips were caught, but neither was identified. The method adopted was to expose small bowls, each containing about half a pint of water with 2 c.c. of the aldehyde stirred up in it. The insects attracted are drowned in the water. The experiments were made in November and December, a season when Thrips is far from abundant, and consequently the figures showing the numbers caught are small. The author believes that in warmer weather the catches would be larger. He proposes to continue the experiments in warm weather and to use nitrobenzene, a substance which does not contain the aldehyde group, but which has a smell closely resembling that of benzaldehyde. It should then be possible not only to obtain more evidence as to the practical economic value of the method, but to ascertain also whether the attractiveness is due to the presence of the aldehyde group, or whether the insect's olfactory sense is, like our own, similarly affected by nitrobenzene and benzaldehyde.

HOOD (J. D.). **On the proper Generic Names for certain Thysanoptera of Economic Importance.**—*Proc. Entom. Soc., Washington*, xvi, no. 1, March 1914, pp. 34-44.

The author contends that the tobacco thrips, the pear thrips and the orange thrips—species responsible in the United States for damage amounting to many thousands of dollars every year, are at present wrongly placed in the genus *Euthrips*, Targ., and should be known as *Frankliniella fusca*, Hinds, *Taeniothrips pyri*, Dan., and *Scirtothrips*

citri, Moulton, respectively. The purpose of the present paper is to correct the generic positions of these and allied species. The account is divided into three parts: first, a brief general discussion of the nomenclature of the several groups of species which have been included in the genus *Euthrips*; second, a catalogue of the American components of the genera to which these species belong; and third, a bibliography of all papers necessary to a proper study of these questions.

WALTON (W. R.) **A New Tachinid Parasite of *Diabrotica vittata*.**—*Proc. Entom. Soc., Washington*, xvi, no. 1, March 1914, pp. 11-14, 1 pl.

In 1871 Shimer described a Tachinid parasite of *Diabrotica vittata*, the cucumber beetle, under the name of *Celatoria* (*Melanosphora*) *diabroticae*. The author gives in the present paper an account of a second Tachinid parasite of this beetle, which he described as *Neocelatoria ferox* (gen. et sp. nov.).

COAD (B. R.) & PIERCE (W. D.). **Studies of the Arizona Thurberia Weevil on Cotton in Texas.**—*Proc. Entom. Soc., Washington*, xvi, no. 1, March 1914, pp. 23-27.

In order to establish the taxonomic status of the weevil breeding in Arizona wild cotton (*Thurberia thespesioides*) the authors undertook a number of studies, the results of which are given in the present paper. This weevil very closely resembles the Mexican cotton boll weevil (*Anthonomus grandis*), and an account of it has already been given, under the name of *A. grandis* var. *thurberiae* [see this *Review*, Ser. A, ii, pp. 78-79]. Experiments were made, the principal results of which were to show that the two varieties are able to interbreed and produce fertile offspring. The question whether the *thurberiae* form will flourish on cultivated cotton is now being tested.

PIERCE (W. D.) & MORRILL (A. W.). **Notes on the Entomology of the Arizona Wild Cotton.**—*Proc. Entom. Soc., Washington*, xvi, no. 1, Mar. 1914, pp. 14-23.

The Arizona Wild Cotton plant assumed economic importance on being found in 1913 to harbour a variety of the dreaded Mexican cotton boll weevil (*Anthonomus grandis*, var. *thurberiae* Pierce). The authors have since made a thorough examination of the insects associated with this plant.

The plant is a perennial, resembling the cotton plant so closely that it is locally known as wild cotton: it occurs at altitudes of 2,300-5,000 feet in Arizona. The species of insects recorded from the plant are 83 in number distributed as follows: Acarina 1, Rhynchota 14, Orthoptera 3, Thysanoptera 2, Lepidoptera 7, Coleoptera 24, Hymenoptera 29, Diptera 2, and Strepsiptera 1: according to their behaviour towards the plant these insects may be classified as injurious 25, nectar-visiting 40, parasitic 12, and predaceous 6. The most important injurious insects are the boll-weevil (*Anthonomus grandis thurberiae*), the cotton worm (*Alabama argillacea*), the Thurberia boll worm (*Sacadodes pyralis*, Dyar), a blister mite (*Eriophyes* sp.), a gall-forming insect belonging to the family CECIDOMYIIDAE, and a mealy bug (*Pseudococcus* sp.).

An Act to prevent the Introduction into British India of any Insect, Fungus or other Pest, which is or may be destructive to Crops.

An Act entitled "The Destructive Insects and Pests Act, 1914," which received the assent of the Governor-General of India on the 3rd February 1914, empowers the Governor-General in Council to prohibit or regulate, by notification in the Gazette of India, the import into British India of any article or class of articles likely to cause infection to any crop. Customs Officers are authorized to deal with any such prohibited articles as though they had been restricted or prohibited under the Sea Customs' Act. The Local Government is empowered, subject to the control of the Governor-General in Council, to make rules for the detention, inspection, disinfection or destruction of any such articles or of any article that may have been in contact or proximity thereto. Fines up 1000 rupees may be inflicted for a breach of such rules.

A New Regulation prohibiting the Importation of Potatoes into Canada.

The following Order-in-Council was passed on the 7th March 1914, amending the regulations under The Destructive Insect and Pest Act of the Dominion of Canada, in order to prohibit the importation of potatoes from California:—

"The Regulations under 'The Destructive Insect and Pest Act,' established by Order-in-Council, dated 11th May, 1910, are amended by adding to Section 12 thereof, which contains a list of destructive insects, pests and diseases to which the said Act shall apply, the following insect pest—'the Potato Tuber Moth (*Phthorimaea operculella*, Zell.)'; and by adding to Section 13, after the word 'Miquelon' in the second line thereof, the following words, 'also the State of California, being one of the United States of America.'"

A Notice restricting the Importation of Coffee Plants or Coffee into the Uganda Protectorate.—*Uganda Official Gazette*, 28th Feb. 1914.

This notice prohibits the importation of coffee plants (whether living or dead) and coffee, other than roasted beans and ground coffee, into the Protectorate except under a written permit previously obtained from the Director of Agriculture. This prohibition does not apply to properly packed and sealed packages of plants or coffee passed in transit through the Protectorate. But if such a package is opened in transit or is so damaged that its contents may escape, the package and its contents may be destroyed without compensation.

VUILLET (A.). **Sur la présence de *l'Aphis maidis*, Fitch, en Afrique occidentale.** [Presence of *Aphis maidis* in West Africa.]—*Bull. Soc. Entom. de France, Paris*, 1914, no. 3, pp. 116-117.

Aphis maidis, the widely distributed pest of maize and Indian millet has been found for the first time in Africa during the past few years. In the French Sudan it has been found both on maize and millet, rolled up in the leaf or on the inflorescence. Although it must be regarded as a pest, it is not the cause of as much damage as is due sometimes to the allied species, *A. sorghi*, Theo.

SHTCHEGOLEV (Ir.). **Непарный шелкопрядъ въ Крыму.** [*Lymantria dispar* L. in the Crimea.]—« **Садоводъ** » . [*Horticulturist*], *Rostov-on-Don*, Jan. 1914, pp. 18-30.

This is a short report on the outbreak of *Lymantria dispar* which took place in 1913 in the Crimea. Normally these insects are not of any great importance, but in 1913 the area infested by them amounted to at least 54,000 acres, mostly forests, with intervening orchards. It was already clear in the autumn of 1912 that an outbreak of the pest was to be expected, as an examination of the forests had shown that there was scarcely a tree which did not bear one or two egg-masses. Sometimes three or four layers of eggs were deposited one above the other, and dead moths were frequently found covered with eggs of other moths; the masses averaged 500 eggs each, this number rising sometimes to 800.

The Entomological Station of Simferopol distributed posters and organized a series of popular lectures on the fighting of these insects; while the Administration of the State Domains (having control over the forests) convened a conference of foresters of the Crimea to decide on a plan of campaign. Attention has been chiefly directed to the protection of the orchards which were the most threatened by the outbreak. As to the forests, it was resolved to limit the campaign only to the protection of the more valuable plantations and nurseries, for the inaccessibility of the mountain forests of the Crimea renders it impossible to take any effective measures for protecting them that would be worth the outlay. A wholesale destruction of the eggs was carried on in the orchards and neighbouring forests by soaking the egg-masses with carbolineum, or with a mixture of kerosene and birch tar, or with crude oil. This method proved most successful, and was preferable to the scraping down of the masses by means of various tools, for in the latter case a considerable number of eggs escaped destruction. In some localities, where the forest boundaries closely approached the orchards, a strip of forest was cut down and burnt. On the cleared space trenches were dug to stop the advance of the caterpillars, or else boards smeared over with tar or some other sticky material were used. In some places the caterpillars were transported by wind over considerable distances—as much as from four to seven miles—and the fight against them had to be conducted incessantly, as constantly fresh swarms were brought by the same means. Insecticides were largely used, chiefly Bordeaux mixture with Paris green, the spraying having frequently to be repeated owing to the rains; the formula recommended was 2·4 drams of green for 2·7 gallons of water. Djipsin also proved very useful, while no effect was obtained by such insecticides as tobacco extract, which is harmless in the case of caterpillars covered with hairs. Sticky bands were applied with success; and the caterpillars were also shaken down from the trees and then destroyed by crushing. American tanglefoot being expensive and not being available in sufficient quantity, cart-grease with ordinary birch tar was used as a substitute and also a mixture of castor oil with resin ($\frac{1}{2}$–$\frac{3}{4}$ lb. of resin added to 1 lb. of heated castor oil and boiled to the proper consistency). Notwithstanding the many defects of the latter preparation, it being often either too liquid or too hard, it proved very useful, although it required much attention from the owners to keep it in working order.

At a later period in the life of the caterpillars the fight against them was assisted by the activity of parasitic Tachinid flies, as well as by an outbreak of flacherie; the pupae also were infected by some disease. All this led to a diminution of the next generation, which appears at the end of summer, and only a few dwarfed specimens of *L. dispar* were found at that time.

According to the author's observations, the eggs are mostly laid at a height of 1–1½ ft. from the ground and only in a few cases were they deposited higher, at from 7 to 9 feet; sometimes they were found underneath the surface of the soil, in spaces between the trunk and the earth. His observations do not confirm the common view that the females prefer the southern side of the trees; he sometimes found trees the northern side of which had more eggs than the southern one, and he is inclined to think that the females are influenced rather by the wind and rain, which drive them to seek protection on the opposite side of the tree, without regard to the question of light or warmth. As to the kinds of trees not injured by the caterpillars, it appeared that they did not touch pear trees in orchards, even when they were situated close to apple trees, which were quite defoliated. In forests they did not attack dwarf medlars, although eggs were sometimes found on these trees; ash trees suffered little, while the greatest damage was caused to oaks; all other trees were also more or less injured. All the searching for parasites of the eggs of *L. dispar* proved of no avail and none were reared from the immense number of eggs kept for the purpose, except for a single egg-mass which contained some 20 specimens of *Hadrotus howardi*, Mokrz. In conclusion the author states that in Russia *L. dispar* appears in great numbers only during a short period of successive years—rarely more than three—after which its numbers diminish to quite negligible quantities, chiefly owing to various parasites and diseases, and the unfavourable climatic conditions.

Gowdey (C. C.). **The Yellow-headed Coffee Borer** (*Dirphya* (*Nitocris*) *princeps*, **Jord.**)—*Bull. Entom. Research, London*, iv. pt. 4. Feb. 1914. pp. 279-281.

This Longicorn beetle is a pest of *Coffea robusta* and *C. arabica* in Uganda; it was recorded as such on *C. robusta* for the first time in 1910. Some of the estates have suffered serious damage, especially the older ones which are badly affected by the coffee leaf-disease, *Hemeleia vastatrix*; with a single exception, outbreaks of the pest have been traced to plots where the leaf-disease was already prevalent and where the trees were consequently least vigorous.

Regarding its life-history the author has made the following observations. The female beetle loosens a bit of bark on a branch, from 4-6 inches from the tip, and lays its eggs singly under the bark. The young larva bores into the main stem and downwards into the cambium; the tunnels continue to the surface of the ground and often extend into the main root, being sometimes as much as 4 feet in length; at distances varying from 2–5 inches horizontal tunnels are bored leading to the exterior, for the purpose of getting rid of the frass. Pupation takes place in the stem. The beetle has not been observed to feed either on the leaves or on the bark. The life-cycle appears

to be a long one, extending over two or three years, and larvae of various sizes are to be found throughout the year; the pupal stage lasts from seven to nine weeks, usually from November to December.

The trees attacked may be located by means of the frass at the base. If the presence of the grub is detected in the branch before it has reached the stem, the branch may be cut off and burned. If the grub has already reached the stem, the method of treatment adopted by the author is to seal up the horizontal exits and to drop a few drops of carbon bisulphide or carbon tetrachloride into the tunnel, which may be exposed by cutting off the branch through which the insect entered the stem as close to the stem as possible. When the operation is finished the dust, etc., at the base of the tree should be brushed away, for if none is found on the next visit it may be concluded that the insect is dead. Neither of the above liquids has a harmful effect on the trees. Using paraffin oil instead of these liquids or spearing the insect with a wire, as is done in German East Africa for *D. usambica*, are less satisfactory methods. Trees infested by *D. princeps*, if untreated, are either killed outright, or broken off by the wind on account of the extensive tunnelling. Trees younger than two years do not appear to be attacked.

NEWSTEAD (R.). **Notes on Scale-Insects (Coccidae), Part II.**—*Bull. Entom. Research, London*, iv. pt. 4. Feb. 1914. pp. 301-311. 7 figs.

Thirty-seven species of Coccids are dealt with from the following countries: The Dutch West Indies, Barbados, British Guiana, Zanzibar, Uganda, Nyasaland, and Nigeria. Five species are described as new, namely *Icerya maxima*, on *Ficus* sp., from the Gold Coast; *Aspidoproctus giganteus*, on the Silk Cotton tree (*Ceiba bombax*), from S. Nigeria; *Aspidiotus* (*Pseudaonidia*) *baikeae*, on *Baikea insignis*, from Uganda; *A.* (*P.*) *fossor*, on grape-vine, from Barbados; *Chionaspis funtumiae* on *Funtumia latifolia*, from Uganda.

THEOBALD (F. V.). **African Aphididae.**—*Bull. Entom. Research. London*, iv. pt. 4. Feb. 1914. pp. 313-337. 17 figs.

A complete list is given of the species of APHIDIDAE recorded from Africa. Several of the species mentioned are common also in Europe such as the Common Cabbage Aphis (*A. brassicae*) and the Ribes and Lettuce Aphis (*Rhopalosiphum lactucae*); others have a world wide distribution, having doubtless been disseminated on nursery stock; such are the Black Peach Aphis (*Aphis persicae*) and the Woolly Aphis (*Eriosoma lanigerum*). As regards the group as a whole, it has been very little studied in Africa, and the entire list includes only 35 species. Of these nine are new, namely: *Macrosiphum lophospermum*, from Njoro, British East Africa; *M. lycopersicella* on tomato and rape, from Njoro; *M. neavei*, from Nyasaland; *Macrosiphoniella bedfordi*, on cultivated chrysanthemums, from the Transvaal; *Aphis solanella*, from Njoro; *A. ligustriella*, on privet, from Pretoria; *A. nigripes*, on willow, from Pretoria; *A. africana*, on broom-corn and barley, from Njoro; and *Lachniella thujafolia*, on *Thuja orientalis*, from the Transvaal.

BALLARD (E.). **A list of the more important insect pests of crops in the Nyasaland Protectorate.**—*Bull. Entom. Research, London*, iv, pt. 4. Feb. 1914. pp. 347-351.

A list is given of those insects of economic importance which have been collected or bred from various crops in Nyasaland during the first three months of the planting season 1911–12 and the whole of the season 1912 13. Insect pests of first-class importance are ten in number and are confined to cotton, tobacco and maize; the others included in the list have done sufficient damage to justify regarding them as pests, or are such that an increase in their numbers would be a danger to crops on which they have taken to feeding. *Orthoptera*: ACRIDIIDAE: The most destructive are *Maura bolivari*, Kirby, and *Chrotogonus* sp., both pests of tobacco; less harmful are *Acrida turrita*, L. on tobacco and *Zonocerus elegans*, Thumb. GRYLLIDAE: *Brachytrypes membranaceus*, F., sometimes eats the roots of cotton plants.

Lepidoptera:—NOCTUIDAE: *Diparopsis castanea*, Hmp. (the Red Boll worm), a major cotton pest of great importance; *Chloridea obsoleta*, F., destroys the bolls and flowers of cotton and attacks maize, tobacco seed-pods, and chick-peas; *Earias insulana*, Boisd., a cotton pest, but partly kept in check by an ichneumon parasite; it is also found on garden Hibiscus; *Euxoa segetum*, Schiff., is responsible for much loss in tobacco fields by cutting the stems; *Prodenia litura*, F., occurs on tobacco, cotton and maize, and was once found on tea; other species damaging cotton by eating the leaves in the first stages of growth are *Plusia orichalcea*, F., *Cosmophila erosa*, Hb., *Gonitis sabulifera*, Guen., *Plusia chalcites* and *Acontia graellsii*, Feisth. *Busseola fusca*, Hmp., is one of the worst pests in the Protectorate, causing a great annual loss in the native gardens by boring in the stems of maize and millet. *Pteronycta fasciata*, Hmp. (gen. et sp. nov.) bores in the stems of cotton, which are consequently very liable to be broken by the wind; it is at present uncommon. LIMACODIDAE: *Parasa vivida*, Walk., is an occasional but destructive pest of coffee. LYMANTRIIDAE: *Heteronygmia leucogyna*, Hmp., a serious pest of mahogany. PYRALIDAE: *Sylepta derogata*, F. is rare in the Zomba district, but is a serious pest of cotton further north; the larvae are parasitised by a Chalcid. TINEIDAE: *Phthorimaea heliopa*, Lower, a stem-borer of young tobacco and a serious pest; *Gracilaria* sp. nov. ?, a common, but at present not serious, pest of cotton. NYMPHALIDAE: *Hypolimnas misippus*, L. on cotton.

Coleoptera:—LAGRIIDAE: *Lagria villosa*, F., moderately destructive in vegetable gardens to leguminous plants. GALERUCIDAE: *Ootheca mutabilis*, Sahlb., on cotton, leguminous and cucurbitaceous plants; *Diacantha conifera*, Fairm., also on leguminous and cucurbitaceous plants: *Asbecesta cyanipennis*, Har., on leguminous plants; *Pachytoma gigantea*, Fll., on Mlanje cypress. TENEBRIONIDAE: *Zophosis* sp., a minor pest of cotton and tobacco; *Gonocephalum simplex*, F., on tobacco. MELOIDAE: *Mylabris tricolor*, Gerst,. *M. amplectens*, Gerst., *M. dicincta*, Bert., *Decatoma catenata*, Gerst., are all destructive flower-eaters, occurring on cotton; *Ceroctis trifurca*, Gerst., eats the flowers of soya and velvet beans. CURCULIONIDAE: *Apion armipes*, Wagn., on cotton; a species of *Isaniris* is a general but not very destruc-

tive pest on cotton. COCCINELLIDAE: *Epilachna dregei*, Muls., *E. hirta*, Thumb., and *E. paykulli*, Muls., are major pests in vegetable gardens; *Chilomenes lunata*, F., preys on the cotton aphis, and is a very useful insect. CASSIDIDAE: *Cassida gibbipennis*, a minor pest on leguminous plants. NITIDULIDAE: *Epuraea* sp., eating stamens of cotton flowers.

Hymenoptera:—TENTHREDINIDAE: *Athalia* sp., a major pest on turnips and cabbages.

Rhynchota:—APHIDIDAE: *Aphis gossypii*, Glover, very troublesome on cotton; *Aphis brassicae*, L., on cabbages; COCCIDAE: *Pulvinaria jacksoni*, Newst., occurs occasionally on cotton. COREIDAE: *Anoplocnemis curvipes*, F., on cotton and on mahogany. PENTATOMIDAE: *Antestia variegata*, Thumb., a serious pest of coffee. *Atelocera stictica*, Westw., on young shoots of mahogany. PYRRHOCORIDAE: *Dysdercus nigrofasciatus*, Stål, a major pest of cotton; *Odontopus confusus*, Dist., on cotton.

Order in Council under Sections 2 and 3 of "The Destructive Pests Ordinance 1912" with respect to Cocoa and Rubber Plants and Seeds.—*Gold Coast Government Gazette, Accra.* no. 68, 23rd Aug. 1913, p. 945. [Received 15th April 1914.]

This Order in Council contains the following provisions:—

It shall not be lawful for any person to import any cocoa or rubber plants or seeds into the Gold Coast Colony except through the Ports of Accra and Sekondi. No cocoa or rubber plants or seeds shall be so imported which have not been disinfected before shipment in a manner approved by the Director of Agriculture. All cocoa and rubber plants and seeds so imported shall be accompanied by a certificate, to the satisfaction of the Director of Agriculture, certifying that such disinfection has been duly and properly carried out. All cocoa and rubber plants and seeds arriving without a certificate, or with a certificate which is not to the satisfaction of the Director of Agriculture, shall be destroyed, or landed at such place as the Director of Agriculture may direct and there disinfected under his supervision at the expense of the importer.

VUILLET (A.). **Le Thrips du Poireau.** [The Thrips of the Leek.]—*Rev. Phytopath. App., Paris*, i, no. 10, 20th Oct. 1913, pp. 136-137. [Recd. 30th March 1914.]

Thrips tabaci, Lind., is common in both the Old and New Worlds. In the United States it is known as the onion thrips, and it seems to have been introduced there from Europe. It occurs throughout the whole year on a great number of plants belonging to very different families such as the Cruciferae, Leguminosae, Caryophyllaceae, Compositae, Solanaceae, Labiatae, Liliaceae, etc. The families Liliaceae and Solanaceae are the ones which perhaps suffer the most. With regard to the leek, for several years Blais observed that this plant became discoloured towards the middle of summer, whilst small larvae swarmed in the folds of the leaves. In 1913, the first damage was observed at the end of June, and the perfect insect appeared at the beginning of September. The attacked leaves first became

discoloured and then the ends dried off. The plants would not grow and the attack of the Thrips reduced the harvest by 50 per cent. The insects persist through winter generally on stray plants or under dead leaves. The time taken for the complete transformation varies greatly according to conditions, the insects observed by Lindeman in Bessarabia taking 47 days, while those bred by Quaintance in Florida took only 17 days. Most authorities consider that the multiplication of *Thrips tabaci* is favoured by drought and seriously hindered by rain. The author however is of the opinion that moisture is not really unfavourable to this insect, but rather that drought weakens the plants and diminishes their resisting power. Fields are often invaded by Thrips which have hibernated and developed on wild plants. The destruction of such vegetation on the borders of fields would therefore be a preventive measure, especially if it be burnt during the winter. In order to counteract the effect of drought and allow the plants to resist effectively the attacks of the insect, irrigation should be employed where possible. Most contact insecticides are effective against this Thrips, but unfortunately the insects are difficult to reach since they occur in the folds of the leaves. A simple 3 per cent. soap solution is effective in most cases.

HOLLOWAY (T. E.). **The Prospect of controlling the Sugar-Cane Borer more efficiently.**—*Louisiana Planter and Sugar Manufacturer, New Orleans, La.*, li, no. 25. 20th Dec. 1913, p. 416, 3 figs. [Recd. 30th March 1914.]

Experiments on the control of the sugar-cane moth (*Diatraea saccharalis*) have been extraordinarily successful. On the Piper plantation, Texas, no cane trash was burned in the autumn and winter of 1912-13, but it was all ploughed under in the spring of 1913. On the neighbouring plantations the trash was burned in the autumn as usual. On examination it was found that the average infestation of the unburned fields was 30·6 per cent., while that of the burned fields was 76 per cent. In 1912, the average infestation of the burned fields was 50·5 per cent. and a few miles away 86 per cent. Burning over a field is the obvious method of controlling an insect pest in certain cases, but the sugar-cane field presents a different problem. The borers stay in the stalks and when the stalks are passed through the mill the borers are killed. On the field are left a few borers in the tops, and probably more in the stubble, and egg-parasites on the leaves and in the egg-masses of the borers which are attached to the leaves. If the leaves are burned, many parasites are killed and only a few borers. When the cane begins to grow next season, the borers come up from the stubble, and very few parasites are then present to control them. These parasites are very valuable in destroying the eggs of many other moths besides those of the sugar-cane moth and should in no way be destroyed. From these experiments the author is of opinion that the disposal of the trash by ploughing under will give the most satisfactory results, though he notes that the plan of raking the trash to the headlands, as done by Mr. Taggart at Audubon Park, resulted in a greater reduction in the percentage of infestation than was accomplished by ploughing the trash under in the spring in Texas.

Morgan (A. C.) & Crumb (S. E.). The Tobacco Splitworm.—*Bull. U.S. Dept. Agric., Washington, D.C.*, no. 59, 19th Jan. 1914. 7 pp. [Recd. 14th April 1914.]

The tobacco splitworm (*Phthorimaea operculella*, Z.) has been reported as having done serious damage to the potato in California. The variation in food habits had created the suspicion that the form working upon potatoes might be specifically distinct from the one attacking tobacco. During the summer of 1913 experiments were conducted to determine this point. The earlier stages of the two types differ only in size and coloration. By transposing the food-plants the larvae can be made to approach each other in colour, and this character is therefore scarcely sufficient to justify a specific separation. The difference in size disappears when the potato-tuber moth is reared on other plants. In the United States the species occurs in California and southward from a line connecting the District of Columbia and Colorado, including Tenessee, Virginia, North Carolina, South Carolina, Florida and Texas. The known range also includes Cuba, Costa Rica, Peru, Hawaii, Australia, Tasmania, New Zealand, Sumatra, Transvaal, Rhodesia, Algeria, and Southern Europe. The known food-plants of *Phthorimaea operculella* include *Solanum torvum*, *S. verbascifolium*, *S. carolinense*, *S. nigrum* (?), egg-plant (*S. Melongena*) potato, tomato, *Physalis peruviana*, *Physalis* sp., *Physalodes physalodes*, *Datura stramonium*, and tobacco. The larva occurs as a borer and also as a leaf miner, the former probably being the original habit. In Cuba and the United States the insect is known on tobacco as a leaf-miner only. A boring tendency is still apparent, however, as noted by Houser, in that the larva usually tunnels the midrib or a vein in addition to mining the membrane of the leaf. Only the older tobacco leaves are affected, unless the infestation is very severe, and they become blotched, the tobacco being rendered unfit for wrappers. In mining the leaf the larva spins a tent of silk and under this consumes the parenchyma. Eggs are deposited singly on the foliage of the host plant and, after about four days, the larvae emerge. The larva is very active and continues its work for about 15 to 17 days, after which it pupates in a tough cocoon of silk and débris in the clods or rubbish at or near the surface of the soil, the pupal stage lasting from six to nine days. Descriptions are given of the various stages and tables showing the times occupied by them. Two larval parasites are recorded, namely, the Braconid, *Chelonus blackburni*, Cam., and the Ichneumonid, *Limnerium polynesiale*, Cam. As remedial measures Quaintance recommends pinching the larvae in the leaves and the destruction of all trash in and around tobacco fields and barns. In severe infestations it may be necessary to prime off and destroy the leaves infested by the earlier generations. It is also well to transplant the crop as early as possible, in order to mature it before the appearance of the most destructive generation of the splitworm. All tobacco stubble should be destroyed as soon as the crop is harvested, to prevent the breeding of a hibernating generation. Potatoes should not be followed by tobacco, for the infestation of tobacco has been more severe in such cases, than where a different rotation was followed. Potatoes and tobacco should be grown as far apart as possible.

Mitteilungen der Station für Pflanzenschutz in Hamburg. [Communications from the Hamburg station for plant protection.]—*Zeits. für Pflanzenkrankheiten, Stuttgart*, xxiv, no. 1, 31st Jan. 1914, p. 41.

The San José scale was found on 2·29 per cent. of fresh fruit imported from North America, and on 0·25 per cent. of that from Australia. The living plants on which it was found were two *Prunus* in pots from Japan. The drought caused an increase of the Aphids on many field and garden fruit-trees, many varieties of beans suffering from the attacks of the black aphis. Bird protection was advanced by the provision of suitable copses, nesting places, feeding places and the circulation of advice on the subject.

JOHNSON (F.). **The Grape Leafhopper in the Lake Erie Valley.**—*Bull. U. S. Dept. Agric., Washington, D.C.*, no. 19, 24th Jan. 1914, 47 pp., 13 figs., 3 pls.

The grape leaf-hopper, *Typhlocyba comes*, Say, and its several varieties are of common occurrence on native grape-vines throughout the United States and Canada, having been first recorded from Missouri in 1825. During the growing season of the grape-vine, this leaf-hopper apparently confines its attacks to the foliage of this plant. Early in the spring the adults feed on the new foliage of almost any plants with which they come in contact, whether it be the foliage of trees and shrubs in woodlands, or the weeds and grasses in the more open arable and pasture lands; but when the leaves of the cultivated vines unfold there is a complete migration of the hoppers from the wild plants, including the wild grape-vines, to the cultivated vines. By repeated observations it has been found that this insect reproduces only on the foliage of wild and cultivated grapes, and more freely upon the latter. The insect in its nymphal and adult stages sucks the juices from the leaves, causing, in severe cases, the whole vine to become dried up and almost functionless long before the normal ripening of the fruit. Prof. H. J. Quayle states that with the exception of *Phylloxera*, the vine-hopper is undoubtedly the most destructive insect pest of the vine in Ohio State. The insect is generally present everywhere and may occur for several seasons without attracting attention; then it begins to increase and finally becomes so abundant as to cause severe damage. The species most commonly associated with *T. comes* is *T. tricincta*, the proportion of the species varying in different areas. *T. vulnerata* was also present on the North, South and Middle Bass Islands, and on Kelly's Island. The adults usually commence to attack the vines about the middle of May, and in 1912 the first eggs were found on 10th June, and the appearance of a new brood occurred on 12th July. From experiments it would seem that some females may deposit about 140 eggs. In normal seasons the majority of the first brood adults appear after the middle of July and the nymphal period is lengthened by low temperatures. If high temperatures prevail, the nymphs develop rapidly and these will mate and deposit eggs resulting in a second brood of nymphs. Towards the middle and end of September, the adults of both broods migrate from the vineyards and come to rest in adjoining woodlands or rough pasture lands, later seeking the shelter of leaves and trash. During investigations on this pest only one instance of parasitism was noted, when P. R. Jones

observed a female *Aphelopus* sp. (PROCTOTRUPIDAE) thrusting her ovipositor into the body of a nymph. On the other hand the nymphs seem to be specially subject to the attack of predaceous enemies which include *Hemerodromia superstitiosa*, Say, and *Hyaloides vitripennis*, Say, *Rhyncholophus parvulus*, Banks, the larvae of *Chrysopa*, ants, and coccinellidae, and spiders. In one case the leaf-hoppers were found to be attacked by *Empusa*, sp. Numerous control methods are mentioned and references to them given in a lengthy bibliography. In the vineyards in Chautauqua County, N.Y., Slingerland carried on extensive experiments with sticky shields for catching the adults before the commencement of oviposition, the most practical shield for trellised vineyards being constructed and used as follows: Make a light wooden frame about seven or eight feet long and four feet wide, having the bottom cross-piece about a foot from the ground and fasten to this stiff wires extending down nearly to the ground and bent inward something like hay-rake teeth. Tack over this a strip of table oilcloth 1¼ yards wide and let it extend down over the curved wire teeth so that when the shield is held beside a vine, the oilcloth will come under the vine to catch the "hoppers" that try to drop to the ground. Cover the oilcloth with the "stick-em" and all is ready to operate. Two men, each carrying one of these light sticky shields on opposite sides of a trellis of vines, can reach over the shields, jar the vines to disturb the "hoppers" and thus go over an acre of vineyard in a little more than an hour.

In California, where the vines are not trained to a trellis, Mr. Quayle found that a screen cage, having the inside smeared with crude oil, with one side open and a V-shaped opening cut in the bottom to admit the stem of the vine, could be used quite effectively in the vineyards to catch the adults before oviposition commenced. Owing to the migratory habit of this insect the destruction of leaves and trash in vineyards cannot have very great results. Sprays used against the adults are of little value owing to the agility of the winged insects and the protection afforded to their bodies by the wings. Against the nymphal stages the following solutions have been used with great success:—1 lb. whale-oil soap to 15 gallons of water; or 1 lb. resin to 15 gallons of water, adding enough soda or potash to dissolve the resin completely, i.e., 1 lb. of soda to about 8 lb. of resin. This soapy liquid has a tendency to form a drop on each berry which causes an undesirable discoloration on the grapes. In the last few years therefore tobacco extracts have been used instead. These, used according to the following formulae, have given excellent results: (*a*) tobacco extracts containing 2·7 per cent. nicotin sulphate, diluted in the ratio of 1 part to 150 parts of water; (*b*) tobacco extracts containing 40 per cent. nicotin sulphate, diluted in the ratio of 1 part to 1,500 parts of water. The most effective time to make the tobacco spray application against the nymphs is just before those that hatched earliest in the season have reached the fourth moult, i.e., when the wing pads extend about one-third the length of the abdomen. When it is deemed expedient to use sticky shields to capture the adults, the best sticky substance to use is a mixture of melted resin, 1 quart, in 1 pint of castor oil, smeared liberally over the face of the shield. Successful control of the nymphs by spraying depends on thoroughly wetting all parts of the underside of the infested leaves with the spray liquid.

MORSTATT (H.). **Arbeiten über Schädlinge der Kulturpflanzen.** [Studies of pests of cultivated plants.]—*Der Pflanzer, Dar-es-Salaam*, x, no. 1, Jan. 1914, pp. 36-39.

This is a chapter of Dr. Morstatt's Zoological Report embodied in the Annual Report of the Biologisch-Landwirtschaftliches Institut at Amani, 1912-1913. No extensive outbreaks occurred in the twelve months under review. Some damage was done by *Pseudococcus citri* to mango and other trees, chiefly on the coast, and by a weevil, *Apion xantho-stylum*, to cotton in Morogoro; a disease of cotton was caused by Aphids in Mwanza, and a great increase of *Coccus viridis* on coffee was observed in Meru. With the exception of that of *Apion*, all these epidemics were probably connected with the dry weather.

Cotton pests. The weevil already mentioned requires serious attention as it has been shown that its larvae also develop under the bark of the woody portions and this often seriously checks growth. The *Mafuta* disease due to Aphids is not important. Reported from Amani last year, the boll-worm *Pyroderces simplex* (*gossypiella*), Wlsm., has now appeared in Mombo. It is of no importance compared with the pink boll-worm. Another species of stainer, *Dysdercus festivus*, Gerst., now brings the number known up to five. In general it does little damage.

Coffee pests. The white coffee borer *Anthores leuconotus* was reported from plantations hitherto immune in Usambara, Kilimandjaro and Meru. A regular control is necessary, as this pest constitutes a constant danger to the plantations, although with careful planting supervision serious damage need not be feared. The effect of weather conditions combined with thorough preventive measures have brought the green scale under control.

Pests of Vegetables. A sawfly, *Athalia* sp., has much increased and its larvae did great damage to mustard and other cruciferous plants. The diamond backed moth, *Plutella maculipennis*, Curt., was as numerous as in the previous year.

Cacao pests. *Ceratitis anonae*, Graham, attacked cacao, but so far the ripening of the pods has not been affected. A leaf-eating weevil, *Polyrhabdotus transversalis*, Fst., also occurred on cacao.

Rubber pests. A termite near *Termes natalensis*, Hav., and new to East Africa, is an important new pest. It destroyed numerous *Manihot glaziovii* trees in various plantations. It either gnaws the wood under the tapped bark, or destroys the roots. A detailed report will follow.

Bean pests. The Wonder beans (Kundebohne) planted at Amani were badly attacked during the year. The small weevil, *Apion [illegible]* var. *vicinum*, Wagn., was the pest most frequently met with. In beans planted for the purpose of breeding the pests, the beetle *Bruchus chinensis*, L., developed in large numbers. Other beetles found there were the Anthribid, *Araeocerus fasciculatus*, de G., and a very small Scolytid. Three moths also occurred, *Sitotroga cerealella*, Ol., being the commonest.

Coconut pests. The palm beetle, *Rhynchophorus phoenicis*, occurs in the Dar-Es-Salaam district, but is not an important pest as yet.

Extrait du Procès-Verbal de la Séance de la Section de l'Entomologie. [Extract from the Proceedings of the Meeting of the Entomological Section.]—*Bull. Soc. Nat. Acclimat., Paris.* lxi, no. 3, 1st Feb. 1914, pp. 84-85.

M. Rivière reported on the damage caused by the bug, *Aelia germari*, to cereals. This insect appears to be spreading in North Africa, especially in the province of Oran, Algeria. The insect attacks the ear of the cereals and sucks the sap from the seed, preventing germination. Several plants, chiefly graminaceae and especially the genus *Stipa*, seem to be visited by these insects, and at night *Aelia* takes refuge in other plants, returning to the cereals during the daytime. No method of control is known. *Aelia germari* closely resembles *A. acuminata*, L., which is common throughout Europe.

Termites or white ants.—*Agric. News, Barbados.* xiii, no. 309, 28th Feb. 1914, p. 74.

The occurrence of termites in St. Kitts, as a pest of growing sugar cane, has been referred to from time to time. Collections of these and other termites, from the same and other islands, have been made and sent to the Imperial Bureau of Entomology for study. The material submitted was found to include eleven species, of five genera. *Calotermes balloui* occurred in Grenada and St. Vincent, *C. castaneus* in Barbados, *C. incisus* in Barbados and St. Kitts, and *C. venezolanus* in St. Kitts. *Eutermes acaqutlae* occurred in Porto Rico, *E. costaricensis* in St. Kitts,* *E. haitiensis* in Montserrat, Antigua and St. Kitts, *E. sanctae-luciae* in St. Vincent. *Leucotermes tenuis* occurred in Barbados, *Mirotermes marshalli* in St. Kitts and *Rhinotermes marginalis* in Barbados. *Leucotermes tenuis* is the species responsible for the serious injury to cane in St. Kitts, while the species of *Eutermes* attack cane plants in the field in Antigua and Porto Rico. Two species of *Calotermes* attack living trees *C. balloui* being reported from cacao trees in Grenada, and from the heartwood of a *Pithecolobium* in St. Vincent, and *C. incisus* in the wood of a living avocado pear tree in Barbados.

COMTE (—). **La Mouche du Chou.** [The Cabbage Fly *Chortophila* (*Anthomia*) *brassicae*, Bouché.]—*Rev. Agric. Vitic. Afr. Nord, Algiers*, xii, no. 101, 14th Feb. 1914, pp. 148-151, 2 figs.

This insect is a fly of the family ANTHOMYIDAE, the larvae of numerous species of which live in decomposing vegetable matter and occasionally in the digestive tracts of animals. In the adult stage they cause injury to the plants by sucking out the juices. According to A. Mazières, the cabbage fly caused serious damage to young cruciferous plants in Algeria during the autumns of 1911 and 1912. In Tunis, where similar damage is done, the author found that the bionomics of this insect differed greatly from that given by Mazières. Great variations also exist between Central and Northern Europe in this respect, since the climatic conditions are very different. The

* The localities for *E. acaqutlae*, *E. costaricensis* and *E. sanctae-luciae* have been altered in accordance with a correction published in the *Agric. News* for 14th March, 1914, p. 90.

adult appears in autumn, and the female deposits about 50 eggs on the stems and on the lower parts of the petioles of the leaves. The larvae emerge about ten days later, and feed on the delicate young leaves. After about four weeks they pupate in the plant, or more often in the soil, and 15 or 20 days later, according to the temperature, the adults of a new generation appear. Usually there are three generations a year, the adults appearing in October, January and March. Metamorphosis is slightly retarded in winter, but is completely suspended in summer. Three or four larvae are sufficient to stop the development of a young cabbage; the older plants are more resistant. This insect may be controlled to some extent by insecticides; e.g., a mixture of 60 parts of lime and 30 parts of fresh pyrethrum powder, or a 12 per cent. emulsion of petroleum and water. These insecticides will not destroy the eggs nor the larvae, serving only to keep away the adults at the time of oviposition. The petroleum may be used on young plants which are not to be offered for sale for two or three months. In infested fields, plants containing larvae should be pulled up and burned.

SURFACE (H. A.). **Angoumois Moth.**—*Wkly. Zool. Press., Bull. Dept. Agric., Harrisburg, Pa.*, no. 257, 30th March 1914.

The Angoumois grain moth (*Sitotroga cerealella*, Ol.) occurs abundantly in Berks county, Pa. It lays its eggs on the wheat while in the straw and if wheat is permitted to remain unthreshed in the barn the moths infest it. Wheat threshed early is safe from attack. If at once placed in bins it can then be kept without serious damage except to the top layer, in which the pest can be killed by sprinkling carbon bisulphide over the wheat and covering with wet blankets.

VUILLET (A.). **Un ennemi du fraisier.** [An enemy of the strawberry plant.]—*Rev. Phytopath. App., Paris*, i. nos. 6 & 7, 20th Aug. and 5th Sept. 1913, pp. 97-98.

In June 1913, the Entomological Station in Paris received two specimens of a Tenthredinid larva injuring strawberry plants. From these *Cladius* (*Piophorus*) *padi*, L., were bred. Though not previously recorded, the presence of this insect on the strawberry is not surprising, as it feeds on many plants. Cameron states that the eggs are laid on the under side of the leaves, early in May. The very young larvae only attack the epidermis, but later on they make large holes in the stem and if present in numbers, considerable damage may be done. There are several (2-4 ?) generations in a year, the number probably varying with the locality. The nymphal stage, of the summer generation at least, is passed on the ground in a white cocoon spun among the dried leaves. The larva of *Cladius padi* is parasitised by *Tryphon lucidulus*, Hart., and *Ichneutes reunitor*, Nees. Spraying the under side of the leaves with nicotin or arsenic might be practised before flowering takes place and also after the crop has been picked.

Vargas Vergara (J. M.). El mión. [The froghopper (*Tomaspis bogotensis*).]—*Rev. Minist. Obras Publicas, Bogotá*, xii, nos. 10-11-12, Oct.-Nov.-Dec. 1913, pp. 470-472 and 547.

For years pastures in the Tocaima and Casasviejas region of Colombia have suffered from the ravages of an Homopteron of the genus *Tomaspis*. Specimens sent to the Imperial Bureau of Entomology have been determined as *T. bogotensis*, Dist., sp. n. The insect is known locally as *el Mión*.

Weldon (G. P.). A case of arsenical injury to apricot trees.—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, ii, no. 12, Dec. 1913, pp. 766-768, 2 figs. [Received 22nd April 1914).

It has been known for some time that arsenic applied to trees in the form of lead arsenate, Paris green, etc., for the control of insect pests, may accumulate at the crown of the root and a sufficient amount become soluble to corrode the bark and girdle the tree. The foliage becomes small and yellow early in the season; usually the crop is heavy and also highly coloured. Longitudinal cracks occur in the bark which may also be of an unnatural colour. In all cases the injury to the bark begins on the outer surface, and gradually eats its way through to the cambium. The wood, both of trees and roots, is more or less blackened, and, when injury is at all severe, girdling and death takes place.

A case of injury to apricot trees is noted from King's County. Early in the season climbing cutworms gave great trouble and the owner of the orchard heaped a mash of bran and Paris green about the root crowns of the affected trees. Later the orchard was irrigated and the trees soon became sickly, many dying outright. On 28th October some of the trees were still alive, but showed the characteristic symptoms of arsenical injury. It seems probable that alkali in the soil and water aided the breaking down of the Paris green, thus liberating soluble arsenic which damaged the trees. Orchard owners are warned to be moderate in the use of arsenic, and if there is any possibility of the formation of a collar of arsenic at the ground line, the soil should be removed, and with it the arsenic which unavoidably runs down the trunks in the process of spraying.

Vosler (E. J.). Recent importations of beneficial insects into California.—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, ii. no. 12, Dec. 1913, pp. 770. [Received 22nd April 1914].

The State Insectary received in August from Mr. H. A. Ballou, of the Imperial Department of Agriculture for the West Indies, a consignment of parasitised black scale material, from which were reared several hundreds of specimens of the predaceous egg parasite. *Lecaniobius cockerelli*, which have been liberated in an infested section, and the results are awaited with interest.

Professor S. I. Kuwana sent a consignment of mealy bug parasites from the Imperial Agricultural Experiment Station of Japan. Various species of hymenopterous parasites have been reared from this material, and they are now being bred in quantities for release in infested sections.

From the Philippines red scale infested with a small internal parasite was received, and also two consignments of black scales from which a Pteromalid egg parasite was obtained. Mr. C. H. T. Townsend sent parasitised black scales from Peru, from which several specimens of a large Encyrtid, which attacks old scales, were obtained.

VOLSER (E. J.). **Calendar of insect pests and plant diseases.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, ii, no. 12, Dec. 1913. pp. 772-775. [Received 22nd April 1914].

The author mentions the red-humped caterpillar, *Schizura concinna*, S. & A. as requiring checking in December and January by hoeing and cultivating close to the fruit trees. The California tussock moth (*Hemerocampa vetusta*, Boisd.) is distributed throughout the central portion of the State, and is especially abundant along the coast. It feeds on the leaves and young fruit of the apple, as well as upon live oak, lupin, cherry and walnut, though the apple is the favourite. When caterpillars have been abundant during the previous season, the author advises handpicking the egg-masses from the limbs and trunks of trees in the late autumn. They should be destroyed by burning or immersion in oil.

STABLER (H. P.). **Red spider spread by winds.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, ii, no. 12. Dec. 1913, pp. 777-780, 2 figs. [Received 22nd April 1914.]

The author says that in the summer of 1912, a fruit-grower and nurseryman of Sutter County, became convinced from his own observations, that red spiders are carried by wind to a greater distance than is generally supposed. It has long been known that red spiders may be blown from one tree to another, or blown through several rows of trees, but it was generally supposed that a main road, a piece of open ground or similar barrier, was sufficient to prevent the spread of the pest by these means. The matter has been investigated by Mr. E. E. Munger of Yuba City, by placing a sheet of sticky paper on a board fastened to a fence twenty feet away from an infested tree. Twenty-four hours afterwards a great many spiders were found on the paper. On the 5th August a similar experiment was made and the paper was attached to a telephone pole twelve feet above ground, and one hundred feet to the north of a badly infested ten-acre almond orchard of very large trees. Numerous spiders were found next day. On the 10th August, a paper was placed 250 feet from the orchard and 30 feet from the ground and many spiders were found the next day. It was then removed to 650 feet from the orchard to the top of a school house, with the same results.

Experiments were repeated with precautions to preclude all possibility of the red spiders having reached the paper in any other way than by wind carriage. The results were again the same, and it is regarded as established that red spiders are blown sufficiently far to make infested orchards a menace to other orchards within reasonable distances.

Stewart (V. B.). The Importance of the Tarnished Plant Bug in the Dissemination of the Fire Blight in Nursery Stock.—*Phytopathology, Baltimore*, iii, no. 6, Dec. 1913, pp. 273-276, 1 pl.

Considerable attention has been given during the past few years to the dissemination of the fire blight bacterium (*Bacillus amylivorus*) in nursery stock, by various insects. Insects already recorded as of possible importance in this connection are *Aphis pomi*, and the following species of sucking bugs:—*Reduviolus ferus, Plagiognathus politus, Platymetopius acutus, Empoasca mali, Typhlocyba rosae, Campylomma verbasci, Lygus pratensis, Orthotylus flavosparsus, Chlamydatus associatus, Cosmopepla carnifex* and *Siphocoryne avenae*. Among these the tarnished plant bug, *Lygus pratensis*, has appeared to be the most important in transmitting the blight parasite to healthy trees. During July 1913, this insect was very abundant on apples, and as a rule, the blight became more prevalent with their appearance. Experiments were made in order to ascertain to what degree the insect was responsible for its spread; it was shown that insects visting blighted tissue become smeared with the gummy exudation from the blight lesions and carry bacteria to the tender twigs; here, in sucking the sap, the insects puncture the tissues, thus forming a means of entrance for the blight germs, with the result that the twigs may soon become infected. These facts emphasise the importance of removing all blight infections as soon as they appear, as without the sources of infection, the presence of disseminating agents is not so important. Pears, as well as apples, have had the blight transmitted to them in this way.

Crawford (J. C.). Descriptions of new Hymenoptera, nos. 6, 7, 8. *Proc. U.S. Nat. Mus., Washington*, xlv, 22nd May, 1913, pp. 241-260; xlv, 22nd May, 1913, pp. 309-317; xlvi, 23rd Dec., pp. 343-352.

These three papers are systematic in character. The first includes a number of new species, the following being those of economic importance: *Bruchocida vuilleti*, sp. n., from Senegal; *Bruchocida orientalis*, reared from *Bruchus chinensis*, at Bangalore, India. *Coccidoxenus portoricensis*, sp. n., Porto Rico, reared from the "Wax Scale"; *Bruchobius laticeps*, Ashmead, bred from *Bruchus quadrimaculatus*, (no habitat given); *Bruchobius colemani*, sp. n., from *Bruchus chinensis*, at Bangalore; *Cassidocida aspidomorphae*, sp. n., reared from the larvae of *Aspidomorpha miliaris*, at Bangalore.

Most of the species described in the second paper are of economic importance. *Cercocephala atroviolacea*, sp. n., from New Mexico; *Derostenus agromyzae*, sp. n., from Indiana, U.S.A., host *Agromyza angulata*; *D. arizonensis*, sp. n., from Arizona; *D. variipes*, sp. n., from Indiana, *Agromyza pusilla*; *Entedon thomsoni*, sp. n., from Indiana, reared from *Agromyza angulata*; *Cirrospilus flavoviridis*, sp. n., from Utah, reared from *Agromyza*.

The third paper contains the results of an examination of a small but extremely interesting collection from Trinidad, sent by Mr. F. W. Urich. Among the new species described are: *Telenomus tabanocida*, reared from Tabanid eggs; *Perilampidea syrphi*, reared from the larvae of a Syrphid preying on *Dactylopius citri*, found on cacao; and *Signiphora giraulti*, bred from *Dactylopius citri*.

ZAPPELLI (P.). **Anche la "Mosca olearia" finalmente è vinta!** [The olive fly has at last been conquered.]—*L'Agricoltura Sabina, Poggio Mirteto*, xii, no. 12, 31st Dec. 1913, pp. 49-50.

The author states that efficient defence against the olive fly is provided by Professor Lotrionte's system of poison traps, called "capannette" (little huts) because of their shape. A sheet of tin, 14 inches by 10 inches, is bent into a V-shaped gutter which is inverted to form a roof for a bundle of dried olive twigs placed in the hollow and retained there by two galvanised iron wires. The ends of these are brought through the ridge of the roof and are then wound round the lowest horizontal branch of the olive tree requiring protection. It is necessary for some of the twigs to protrude from under the edges of the roof and also for the trap to be fastened very firmly to the branch to prevent it swinging about. Before fastening it, the twigs should be well wetted with the following mixture: Liquid glucose 50 to 60 parts, sodium arsenite 2 parts, boric acid 2 parts, borate of soda 2 parts, all by weight. One trap per tree is required where the tree has few branches and two traps where branches are numerous. If the system is adopted throughout the whole of an extended olive-growing region, one trap for every three or four trees may prove sufficient. Care must be exercised to avoid spilling or dropping the mixture on the leaves and branches of the tree. The mixture must be re-applied about five times during the season by means of a spray pump, with careful attention to avoid spilling. In an experiment which was carried out on about 1,500 trees, the traps were placed in position in the end of June and beginning of July. The five renewals of mixture were made on the following dates:—From 15th to 16th July, 6th to 8th August, 25th to 27th August, 8th to 10th September, 2nd to 5th October. To check results, "control" olive groves were chosen adjoining, but higher up the slope than the plantations treated. As the fly prefers low-lying areas, the control plots were in a more favourable position than the others. Yet of the olives gathered from these trees, from 30 to 50 per cent. were infested and the olives which had fallen on the ground showed a percentage of 80 to 90. In the protected plantations these figures were respectively 1 to 2 per cent. and 4 to 5 per cent. Proceeding to the store-room, a handful of olives from the control trees and another from the treated ones, were taken from the heaps, and whereas the first had 50 per cent. of the fruit damaged the others were quite perfect. The grower had also sprayed the crown of the treated trees with acid Bordeaux mixture containing 1 per cent. lime and 1½ per cent. copper sulphate, with the twofold aim of combating *Cycloconius* and of hardening the olive skins and thus rendering it more difficult for the fly to pierce them; the same spray was used—though to a less extent—on the control trees. The attack of the fly also occurred this year at a very late date—in October—when the fruits were already about to ripen. Thus the results attained are entirely due to the new system. In another district the same experiment was made on over 1,500 trees and with practically identical results. The problem may, in the author's opinion, be considered solved.

DALMASSO (G.). **Un metodo singolare di lotta contro le tignuole dell'uva.** [*A doubtful method of combating the vine moth.*]—*Riv. Vitic. Enol. Agrar., Conegliano*, xx, no. 1, 1st Jan. 1914, pp. 6-10.

Experiments made at the Government Enological School at Conegliano go to support the view advanced by Moreau and Vinet [*c.f.* this *Review*, Ser. A., ii, p. 16] that vine moth control by capture in wine-traps is unsatisfactory. The author concedes that weather conditions were mostly unfavourable, but ill-success cannot be wholly ascribed to this cause, and, in any case, a method which depends so much on suitable meteorological conditions is a very uncertain one at best, as the expense for material and labour is considerable and the traps may be washed out several times in a month by rain. During the month of July 1913 alone, at Conegliano, no less than 5½ inches of rain fell, distributed over 16 days; the traps were either completely washed out or the liquid so diluted as to be useless, and generally there was such a development of mould that the liquid rapidly ceased to attract.

FOUCHER (G.). **Cecidomyid Flies attacking Willows.**—*Bull. Soc. Nat. Acclimat., Paris*, lxi, no. 1, 1st Jan. 1914, pp. 23-26.

The habits are recorded of two willow-feeding Cecidomyias of the genus *Rhabdophaga*, *R. rosaria*, H. Loew, and *R. pulvini*, Kieff. The former lays its eggs on the tips of the branches, causing a cessation of growth, and the larvae develop in galls forming a terminal rosette. The larva of *R. pulvini* lives in the pulvinus of the leaf, where its presence is indicated by a swelling. Infested branches wither and dry completely. In spite of their small size, these two Cecidomyias sometimes cause considerable damage in osier plantations, where they chiefly attack *Salix purpurea*, *depressa*, *aurita* and *cinerea*. The only preventive measure is to remove the infested branches and carefully burn them.

SHTCHEDRITZKY (—). **О поврежденіяхъ озимыхъ всходовъ.**—[On injuries to the shoots of winter-sown grain.] **«Сибирское Сельское Хозяйство.»** [*Agriculture of Siberia.*] *Tomsk*. Jan 1914. pp. 4-5.

The author warns agriculturists of the district of Tomsk, against injuries to their winter-sown crops which may result from the activities of larvae of *Euxoa segetum*. These insects appeared in some parts of the district last autumn and it is likely that, after hibernation, they will again cause damage till about the end of June. To protect the crops from further injuries he suggests harrowing the fields on which the pests appeared last autumn, as soon as the ground thaws, and digging trenches round the areas that were stripped. To prevent damage to autumn shoots he recommends ploughing the fields for the winter crop as early as possible, in any case before June, and subsequently making round the fields a trench about 8–9 inches deep and of the width of a spade; frequent harrowing is advised to prevent the growth of weeds. The author concludes with a brief description of the larva and perfect insect.

Kostarev (N.) **О борьбѣ съ плодожоркой.** [The fight against *Cydia* (*Carpocapsa*) *pomonella*, L., and *Cydia* (*Grapholita*) *funebrana*, L.] — «**Плодоводство**» [*Fruit-Growing*], St. Petersburg, Jan. 1914, pp. 32-38.

This is a paper read by the author at the general meeting of the Russian Imperial Society of Fruit-Growing in December last. He refers first to the enormous amount of damage done by *Cydia pomonella*, which injures as much as 60 per cent. of the apples in the Crimea, while in the governments of Astrachan and Ekaterinoslav and elsewhere, the figure amounts to 90 per cent., thus causing yearly a loss to fruit-growers estimated to reach millions of pounds sterling. While not disputing the importance of the principle of fighting the pest by means of its parasites, the author considers that this method has not yet given practical results in the orchard. He points out the good results obtained in America by means of spraying, and advocates the methods suggested by Dr. Ball and Professor Melander, *i.e.*, spraying under high pressure and directed downwards [see this *Review*, Ser. A., i, p. 276]. He then goes on to deal with *Cydia funebrana*, the damage done by which is more indirect than direct, for its attacks induce the development of the fungi, *Monilia fructigens* and *M. cinerea*.

He further gives an account of some experiments conducted in Sotchi, where *C. funebrana* starts ovipositing after the 14th May. Bordeaux mixture and lime-sulphur, which are so effective against the fungus *Phyllosticta prunicola*, proved less so against *Monilia*. About 2 pints of kerosene emulsion to 10 gallons of Djipsin gave good results, but this insecticide is too expensive; the cost per tree was 14s., as the spraying had to be repeated every 10 days, *i.e.*, 14 times during the summer. A casual observation, that in orchards in which the quantity was too small to be worth harvesting, the plums were less damaged, has led to further investigations which proved that, in orchards where no harvest was obtained one season, the plums were healthy the next year; while in orchards which yielded a good crop one year, the next was considerably diseased with *Monilia*, and the third was altogether ruined. This is explained by the fact that the majority of *C. funebrana* live only one year, and if the next generation finds no food owing to a bad harvest, it dies out; the moths do not fly far and the greater the area affected by a total bad harvest, the less likely are they to appear next year. This led the author to try to prevent a harvest in plum orchards artificially once in every three years, by burning the blossoms of plum trees with sulphate of copper; as a result, splendid plums were obtained and the yield increased, for having had a year of rest, the trees bore a heavier crop.

In summarising his remarks the author recommends the following campaign against *C. funebrana*:—(1) The blossoms of plum trees ought to be burnt with sulphate of copper once in three years, or in a third of the orchard every year, which remedy destroys also many fungus diseases; (2) during the winter and early in spring the withered fruits must be collected and destroyed; (3) the earth in the orchard must be kept friable till the fruits acquire their normal colour; (4) the plums which turn red at the beginning of summer, when the bulk of the plums are still green must be removed and destroyed, as well as all rotten fruit; (5) the following spraying operations are advocated:

(a) Before the unfolding of the flower-buds, spray with Djipsin (about 2 lb. in about 46 gals. of water) as a remedy against *Rhynchites* and with Bordeaux mixture (4 lb. of lime and 4 lb. of sulphate of copper in 46 gals. of water) against *Monilia*; (b) during the time of blossoming, spray with weak Bordeaux mixture to prevent the growth of *Monilia*, this liquid being quite harmless to bees; (c) immediately after the petals have fallen off, spray with djipsin and kerosene emulsion against *C. funebrana* and other pests, and with Bordeaux mixture against *Monilia*; (d) 15 days after that, spray again with weak Bordeaux mixture, which must be repeated in the first half of July and again in August; (e) if Aphids should appear spray with tobacco extract before the leaves begin to curl.

La *Diaspis pentagona* ed il modo di combatterla. [*Aulacaspis (Diaspis) pentagona* and the method of combating it.]—*L'Agricoltura pratico, Genoa*, vii, no. 1, Jan. 1914, pp. 5-6, 7 figs.

The endophagous parasite, *Prospaltella berlesei*, How., has proved of great value in controlling the mulberry scale. In Italy, huge trees entirely covered with *A. pentagona* were completely freed in 18 months. The female Chalcid pierces the Coccid with her ovipositor and deposits an egg in its body. The larval, and sometimes the nymphal, stage of the parasite is passed in the body of its victim, which is devoured until only the skin is left. The scales killed thus assume a bright red brick colour and become transparent and fragile, which is not the case when death is natural. This is a useful indication. *Prospaltella* has four to five generations in a year, all the offspring being females, which lay about a hundred eggs each.

GOURLEY (J. H.). **Spray Calendar for New Hampshire.**—*New Hampshire College and Expt. Sta., Durham, Extension Circular* no. 10, Jan. 1914, 12 pp. 3 figs.

The actual spraying tables are preceded by spray formulae, with full instructions for their preparation. With these is given a three-column dilution table. The first column shows the strength of lime-sulphur solution expressed in Beaumé degrees, the second the corresponding number of gallons of water required to dilute 1 gallon of lime-sulphur for dormant spray, and the third the corresponding number of gallons for summer spray. For instance, to make up a dormant spray, 2 gals. of water should be mixed with 1 gal. of lime-sulphur of 15° B., or 8 gals. water with 1 gal. of 33° B.

PRATT (H. C.) and SOUTH (S. W.). **Progress Report on Locust Work to November 30th 1913.**—*Agric. Bull. F.M.S., Kuala Lumpur*, ii, no. 6, Jan. 1914, pp. 152-156.

So far as can be ascertained, locusts are still confined, in the Federated Malay States, to the States of Selangor and Negri Sembilan. Many swarms of hoppers have been reported from Malacca territory, but none as yet from Pahang. No northerly advance has been made since the last generation. In Selangor during November, there have been no hoppers and the number of swarms decreased from the beginning of the month onwards, swarms probably joining forces.

Egg-laying is expected to commence shortly and the breeding-grounds are being carefully watched. In Negri Sembilan during October and November, the swarms were very numerous and individually small. The periodicity which is so marked a feature in the alternation of fliers and hoppers in Selangor is not so marked in Negri Sembilan, and both have been present all the time. The area of distribution here is very wide, and help has been given in the work by assistants from Selangor. Most locusts have been destroyed by the sheeting and bag-trap method [see this *Review*, Ser. A., ii, p. 110]. For the locusts in paddy small quantities of crude oil or kerosene were poured on the water in the flooded sawahs and the hoppers shaken off the paddy into the oil by means of long bamboos. Many swarms were wiped out by this method. A large number of breeding-grounds were reported from Malay kabuns and estates. Wherever it is possible to flood a breeding-ground, this is the most effective way of destroying the unhatched locusts. A note is made of the necessity of notifying an Inspecting Officer of the presence of locusts on any land as stated in Section 13 of "The Agricultural Pests Enactment, 1913." Only by thorough co-operation of all the planting community will it be possible to make a success of the present locust campaign. Rewards are still offered for reporting breeding-grounds, swarms of first instar hoppers and swarms of 2nd to 5th instars. The report closes with a summary of the locust destruction in Negri Sembilan in October and November, the totals collected being respectively 293 and 1,836 kerosene tins full of these insects.

È questo il momento buono per combattere il pidocchio lanigero del melo. [This is the proper time to combat the woolly apple aphis.]—*L'Umbria verde, Spoleto*, iv, no. 1, Jan. 1914, pp. 10-11.

For winter treatment, a solution of 2 parts by weight of carbolised tobacco extract and a like quantity of carbonate of soda in 100 parts of water, or 1 part of soap and rather less than 1 part by weight of petroleum in 100 parts of water are recommended. The waxy covering may be brushed with a mixture of linseed oil 7 parts, white lead 1½ parts, zinc oxide 1 part, all by weight, which is boiled for 10 minutes, to which when cold is added 1 part of turpentine. A newly introduced method consists of burying calcium carbide, in pieces the size of a walnut, in holes made round the tree. If the soil be damp, the too rapid generation of gas may be prevented by wrapping the carbide in paper.

Ferriana (E. F.). **Come si combatte la fillossera.** [How Phylloxera is combated.]—*Consigliere dell' Agricoltore, Turin*, ii, no. 1, 15th Jan. 1914, pp. 20-21.

If in spite of every care, Phylloxera has gained a footing in the vineyard, bisulphide of carbon may be used against it. A dose of 10 oz. per square yard will destroy, not only the pest, but also the vine, whereas one of ¾ to 1 oz. will destroy all, or nearly all, the pests without injuring the plant. In view of the fact that success is not quite certain and that costs are high, this method is most suited for a vineyard where only a few plants are infested. Flooding gives very good results, but is not applicable in the majority of cases, nor is planting in sand satisfactory. The only method which is really feasible is the replanting with resistant American stocks.

COOLEY (R. A.). **The Alfalfa Weevil.**—*Montana Agric. Expt. Sta., Bozeman, Circ.* 35, Jan. 1914, pp. 191-206. 7 figs, 2 pls.

The alfalfa weevil occurs in Europe, Western Asia and Northern Africa. The attention of the Utah Experiment Station was not called to it until 1907, but it has now spread over many counties in that State and the damage it causes may range from a loss of 25 per cent. to complete destruction of the crop. Early in the spring the hibernating adults emerge and in a few days lay eggs in holes, which they make in the stems of the alfalfa. While the stems are young the beetles feed on them, but when they are older and harder, the weevils feed on the softer epidermis of the stalks and leaves, and may completely defoliate the plants. The eggs hatch in from seven to sixteen days, and after about a month, pupation takes place; about two weeks later the perfect beetle appears. By about 1st August, the beetles have completed their feeding and have crawled or flown away, and for the most part, they pass the winter near the ground hidden in waste material, or buried in the ground. The so-called "spring flight" begins in April; about the 1st July is another period of great activity known as the "summer flight." It is advisable to stimulate the first crop to rapid growth by cultivation, so that it may be harvested just before the larvae would do their maximum damage. The removal of this first crop leaves a nearly bare field. Irrigation should be delayed and the field should be cultivated and brush-dragged.

In shipments examined before quarantine came into operation, weevils were found in three loads of potatoes, which contained 8, 10 and 12 living weevils respectively. There is now an Act to provide for the prevention of the introduction and spread of insect pests and diseases of horticultural and agricultural plants. Under this Act, on 12th September, 1913, the importation into Montana was prohibited of alfalfa hay, forage crops of all kinds, whether loose or baled, alfalfa seed and all nursery stock (unless accompanied by a certificate of fumigation), and fresh fruit and vegetables of all kinds, during the months from April to October, inclusive, from the State of Utah, except that fruits and vegetables may be moved into Montana from Utah on and after 1st August of each year under special conditions regarding packing. The quarantine is in force only during the season of the year when the adult weevils are active, and by this means it is believed that the greater part of the danger of introducing this pest is removed.

BURGESS (A. F.). **The Gipsy Moth and the Brown-Tail Moth, with Suggestions for their Control.**—*Farmer's Bull. U.S. Dept. Agric. Washington, D.C.*, no. 564, 29th Jan. 1914, 24 pp., 10 figs. [Recd. 14th April 1914.]

The gipsy moth feeds on apple, oak, grey birch, alder, willow, beech, poplar, pines and other conifers, apple and oak having suffered most severely. These trees may be defoliated to such an extent as to cause their death. The brown-tail moth commonly feeds on apple, pear, plum, oak and willow, and may be found on elm, maple and rose; it never attacks conifers and is seldom found on ash, hickory, chestnut or birch. Natural enemies are proving very valuable in checking these

pests and parasites are now being imported into America. The enemies which are at present destroying the largest number of gipsy moth caterpillars and pupae, are a Calasoma beetle (*C. sycophanta*, L.), a Tachinid fly (*Compsilura concinnata*, Mg.), and *Apanteles lacteicolor*, Vier. Two species of egg-parasites imported from Japan, *Schedius kuvanae*, How., and *Anastatus bifasciatus*, Fonsc., are also proving of great value. These parasites and enemies, with the exception of the egg-parasites, also destroy the brown-tail moth. *Meteorus versicolor*, Wesm., attacks the latter, but not the gipsy moth.

Among the methods of control recommended for the brown-tail moth is the cutting off of the winter webs and burning them before the caterpillars begin to emerge in April. Spraying in the spring is not a satisfactory method since there is not sufficient foliage to hold the spray. The most effective measure is to spray the trees before the middle of August, using from 6 to 10 pounds of arsenate of lead to 100 gallons of water. One of the best methods of controlling the gipsy moth is to treat the egg-clusters of the insect between 1st August and 1st April with creosote, to which a small amount of lampblack has been added. This mixture is applied with a brush. Burlap and tanglefoot bands are also recommended. The most effective spray for the gipsy moth is arsenate of lead paste applied to the foliage at the rate of 10 lb. to 100 gallons of water, by means of a high power spray in the case of large shade trees. In orchards, early spraying will be sufficient where few egg-clusters are present, or where the infestation is more serious, a second spray in June will be found satisfactory. All poor or hollow trees should be removed, and if near an infested woodland, the trees should be banded with tanglefoot. In cities and towns the same methods can be used, but they will not satisfactorily control the gipsy moth in woodland areas. The treatment of such areas is made more difficult by the fact that they are composed for the most part of several species of trees. Sometimes practical methods of thinning can be adopted so that those species will be left that are only slightly subject to injury by these insects; but the protection of woodland is a problem needing much study and investigation. The damage caused by the brown-tail moth is ordinarily not so severe as that resulting from gipsy-moth infestation, and elimination of oak, scrub-apple, and wild cherry trees greatly assists in reducing the numbers of this pest. Each of the New England States is carrying on work for the control of these insects, a State official being in charge. A brief summary of the conditions of infestation in each State is given with a statement of any special lines of work that are being attempted. The work carried on by the Bureau of Entomology of the United States is designed to check the spread of these insects, and in order to obtain better methods of control the programme includes a thorough study of the food-plants, the feeding habits in the various stages, the rate of increase in the field, the means by which the insects are spread, the introduction and distribution of foreign parasites and natural enemies, and a study of the wilt disease. Silvicultural investigations and scouting work are being carried on to a large extent and this serves to establish the quarantine line. Various parasites have been liberated in all the New England States, and records show that the control work is meeting with a large amount of success.

Contra el bicho moro. [Control of the black (Meloid) beetle.]—*Gaceta Rural, Buenos Aires*, vii, no, 78, Jan. 1914, p. 525.

This insect belongs to the family MELOIDAE and is ½ to ⅝ of an inch in length, with a blackish conical body, covered with light grey pubescence. The perfect insect feeds on the leaves of the potato, tomato, and other solanaceous plants and devours them with such voracity as to strip the fields in a few days. The female oviposits on the ground and the primary larvae emerge in 20 or 25 days. These larvae are active and move about in search of food. When full fed they assume the second sedentary form, their shape altering as they approach the pseudochrysalis stage, in which they pass the winter. From this pseudochrysalis another larva emerges in spring and pupates in a few days, the imago emerging after an interval of 8 days.

The destruction of the beetle may be effected in various ways. The rows of attacked plants may be gone over with a large broad tray into which the insects may be shaken from the plants. This must be done early in the morning and is not much more costly than the use of arsenic, if suitable labour is cheap. The second method is to spray with Bordeaux mixture or other cupric solution. The applications must be made immediately the first insects appear. The addition of 1 part of lysol to 1,000 parts of the mixture is useful. The third method is the employment of copper arsenate in liquid form, 4 oz. being dissolved in 22 gals. water. If of cheap quality, the quantity may be increased up to 8 oz.

MURANIA (G.). **Bianca rossa** (*Chrysomphalus dictyospermi* var. *rinnulifera*, Mask.).—*Rinnovamento economico-agrario, Trapani*, viii, no. 1, Jan. 1914, pp. 7-9.

The author states that the Agricultural Station at Messina has worked out the cost of lime-sulphur for each citrus tree at just under 3 pence for winter treatment and a little less for spring treatment. In the United States, hydrocyanic acid fumigation is practised at a cost of 20 pence per tree, each tree bringing in a net revenue of over 17 shillings. Spraying with lime-sulphur is only of use when the larvae are naked, as the adults have a thick skin which protects them from it. A simple guide is provided by a bottle in which some attacked twigs or leaves are placed in January, May, or August, and daily examined by transmitted light until minute insects are seen wandering on the sides. The appearance of these larvae indicates that the favourable moment for operating has been reached. Of the enemies introduced for control purposes, the Coccinellid beetles, *Chilocorus kuwanae* and *Rhizobius lophantae*, seem efficacious.

ZIMMERMAN (H.). **Einige Beobachtungen über die Johannisbeergallmilbe** (*Eriophyes* (*Phytoptus*) *ribis*, Westwood) **an** *Ribes alpinum* **in Mecklenburg.** [Observations on the currant gall-mite in Mecklenburg.]—*Archiv. des Ver. der Freunde der Naturgeschichte in Mecklenburg, Rostock*, lxvii, pt. 1, 1913, pp. 130-136.

The currant gall-mite (*Eriophyes ribis*) is a pest of currants (*Ribes rubrum* and *R. nigrum*) of widespread distribution, and occurs in the neighbourhood of Rostock, Mecklenburg, on *Ribes alpinum*. Eggs are laid

from January onward, and the young mites appear in March. Among the enemies of this mite are Coccinellid larvae, particularly those of *Coccinella septempunctata*, the hymenopterous parasite *Tetrastichus eriophyes*, and the fungus, *Botrytis cinerea*. If the infestation is slight the buds which are attacked may be removed and burned in December and onwards; if the infestation is great, the whole bush should be burned. Collinge recommends dusting the bushes with a mixture of 1 part lime and three parts sulphur; the dusting should be done at the end of March or beginning of April and should be repeated at intervals.

TURREL (A.). **Les Traitements Arsenicaux en Agriculture.** [Arsenical Treatment in Agriculture.]—*Rev. Vitic., Paris*, xli, no. 1051, 5th Feb. 1914, pp. 150-152.

The author disputes the idea brought forward by M. Cazeneuve, that arsenical treatments are of little value in agriculture. On investigating cases where such treatments have apparently failed, it has been found that either the application has been badly made, or else at the wrong time. Where the application has been made with care, the results have been quite satisfactory. The author has treated 500 acres of vines with arsenates with complete success. The loss was only about 10 per cent., whilst in the neighbouring vineyards 66 per cent. of the harvest was lost. This has been his experience for about three years. In Bouquignau (Aude), *Clysia ambiguella* destroyed about 95 per cent. of the fruit just before gathering, but the following year by use of arsenates, the author was able to save it completely. Arsenical treatments prepared and applied according to the methods recommended by authorities, are of the greatest value to agriculturists, and if the necessary precautions are taken, no danger is involved in their use.

Cephus pygmaeus **attacking Cereals in North Africa.**—*Bull. Soc. Nat. Acclimat., Paris*, lxi, no. 4, 5th Feb. 1914, pp. 122-123.

M. Rivière complained of the rapid multiplication of a sawfly, *Cephus pygmaeus*, which causes great damage in North Africa. The female pierces the stem of any cereal and deposits an egg in the hole. This process is repeated fifteen to twenty times. The larva emerges very soon and rapidly bores its way into the middle of the stem, in the lower part of which it winters as a pupa. After the crop has been cut, the stubble should be burnt, thus destroying numerous pupae. The question whether *C. pygmaeus* can maintain itself on wild grasses requires investigation.

HUGOUNENQ (L.). **La bouillie sulfo-calcique.** [Lime-sulphur mixture.] —*Progrès Agric. et Vitic., Montpellier*, xxxi. no. 6, 8th Feb. 1914, pp. 186-188.

The author points out the difficulties in the preparation of lime-sulphur for a good spray and subscribes to a suggestion of L. Degrully, that a simple way of attaining this end is to replace the lime-sulphur by the alkaline polysulphides produced commercially. He holds that where lime-sulphur is efficacious—as it must be when properly prepared—the alkaline polysulphides will be no less so. Like the lime-

sulphur mixture, which is only an undefined polysulphide of calcium with sulphurous and sulphhydric compounds, the alkaline polysulphides soluble in 2 parts of water act by their causticity and by the sulphur they deposit on the affected parts. This sulphur is extremely active, as it is in a nascent state. The polysulphide in concentrated (20–25 per cent.) solution keeps almost indefinitely. It only requires diluting with water to yield solutions of 1, 2 or 5 per cent. as required at the very moment of application. The author questions whether it is worth while carrying out delicate operations to obtain an unstable and even dangerous product, when the commercial article is of constant quality and needs nothing more than dilution for use.

BORODIN (D.). **Работы по борьбѣ со вредителями и болѣзнями садовъ въ Мартѣ.** [Control measure to be taken against pests and diseases of orchards in March.]—**«Хуторянинъ»** [*Chutorianin*], *Poltava*, 26th March 1914, pp. 333-336, 2 figs.

The author calls the attention of Russian fruit-growers to the necessary preventive measures which must be applied in their orchards during March. He first recommends the destruction of various wintering pests, such as caterpillars of *Aporia crataegi*, *Euproctis chrysorrhoea* and *Cydia pomonella*, and the eggs of *Rhynchites*, *Malacosoma neustria*, *Lymantria dispar* and others. He figures the nests in which the caterpillars of *Aporia crataegi* winter and the lines of eggs of *M. neustria*, and gives in every case information as to how to get rid of the pests. He suggests also the removal and destruction of all withered fruit, which has been left on the trees, as this fosters various fungus diseases, *Monilia* etc. As a protection against scale-insects, he recommends smearing over the attacked parts with California mixture, [see this *Review*, Ser. A. ii, pp. 209-10] and with carbolineum, which latter however can only be applied to trunks and thick branches, for the thin branches and shoots are injured by it. He remarks that Scalecide and some other remedies against scale-insects have not yet been tested sufficiently.

Rept. Dept. Agric. Union of S. Africa, 1st Jan. 1912 to 31st March 1913, *Cape Town*, 1913. [Received 25th Feb. 1914.]

Aspidiotus hederae appeared again on one or two olive trees and the apple and pear trees will have to be treated with lime-sulphur wash next winter for greedy scale (*Aspidiotus rapax*). Olive bug has been less abundant, but has necessitated spraying with McDougall's dip at least once a month. Fruit fly was in evidence, but was kept well in hand with arsenate of lead spray. Among the specimens of vine pests sent in for diagnosis, Dr. Perold found *Phylloxera* and mealy bug. Mr. C. W. Mally, the Cape Province Entomologist, reports on the olive fly parasites. During May and June five lots of olives, presumably infected by maggots of the olive fly, *Dacus oleae*, were sent to Dr. F. Silvestri at Portici, Italy, for the purpose of establishing the South African parasites of this fly in Italy. The results appeared to be negative. Also during April, May, June and July nine lots of black scale (*Saissetia oleae*) were sent to California in order to establish the South African parasites of this scale-insect in America. The

Australian Bug (*Icerya purchasi*) caused considerable trouble at Orchard Siding, especially on Winter Nelis pear trees. Although several colonies of *Vedalia cardinalis* were distributed there, they seemed of little value, and the trees were sprayed during the first week in July with Scalecide. Examination later on in the month showed that the strongest spray (1 : 16) did not completely penetrate the egg-masses, except those that received the full force of the spray. This suggested the idea of "progressive penetration," but this was found to injure the buds and twigs. The Buchu beetle, *Ablabera hottentota*, was the subject of serious complaint during August, owing to its depredations on young buchu seedlings near Piquetberg. Owing to their continually coming in from the veld and the small size of the seedlings, spraying was considered useless, and therefore every plant was protected by a small cap of wire guaze. At Stellenbosch the strawberry ground beetle did serious damage by eating into the half-grown to fully ripe berries. There were hundreds of larvae and pupae in the soil and it was proposed to try and poison the beetles by means of poisoned bait. Strawberry plants were also attacked by the strawberry weevil, (*Eremnus*) the larvae of which fed on the underside of the leaves. A spray of 1 lb. arsenate of lead in 25 gallons of water gave good results. This insect is also known to have other food-plants besides the strawberry, since they were found on matted grass and on old weed roots. The maize stalk-borer (*Sesamia fusca*), was the subject of an inquiry, but the greatest loss in this case was found to be due to a beetle (*Heteronychus arator*), cutworms and yellow stalk-borer (*Sesamia vuteria*). *Heteronychus* especially proved a serious pest; toads and birds were found to devour them, but arrangements were made to try poisoning the beetles with bait. The lucerne *Tylenchus* has been at work for three or four years, but the lucerne holds its own, for the worm disappears as the hot weather approaches. The grain bug (*Blissus diplopterus*, Dist.) was very abundant in the wheat lands in the Piquetberg district during the last week in August, but disappeared after some heavy rains. A weak arsenical sweet was recommended for use against the Argentine ant (*Iridomyrmex humilis*) and seemed to prevent this insect being a nuisance, but it increased rapidly as soon as the laying of the poisoned sweet was stopped. The grape-bunch spider also proved a nuisance to one grower. He had been hand-cleaning the bunches and no better measure could be suggested. If fumigation for vine mealy bug during the winter months proves a success, it may also destroy the winter stage of this spider. The pernicious scale (*Aspidiotus perniciosus*) has not yet been found in this Province.

A report is also made on nursery inspection, and it is stated that a large increase in this work has taken place. The Union legislation, in respect of traffic in plants, admits of much more effective control over nurseries than was practicable under any of the colonial laws. In the period under review 388 nurseries were registered. No nursery is known to be infested with San José scale. Of the pests on account of which quarantines would be imposed, the red scale (*Chrysomphalus aurantii*) is by far the most widespread, and no nursery with citrus stock was found to be absolutely free from this pest. The purple (*Lepidosaphes beckii*) and mussel scales are bad pests in some parts of the country. The former species most unfortunately has become

common as a palm pest. The Ross scale (*Chrysomphalus rossi*) has even greater potentialities as a pest and much trouble is being experienced in the prevention of its spread. Hedge plants are especially attacked by it and it is feared that this pest will attack the magnificent stretches of Australian myrtle (*Leptospermum*). The nursery control service is also endeavouring to hold back the pustular scale of the oak (*Asterolecanium variolosum*). The chaff scale (*Parlatoria pergandii*) and *Aspidiotus dictyospermi* are other potential pests found during nursery inspection. Twenty-seven nurseries were quarantined during the financial year 1912–1913.

References are also made to the plant and potato import regulations. Few of the plants imported during the period under review were found to be infested with pests. However *Lepidosaphes ulmi* (oyster-shell scale) was found a few times, and once in considerable numbers, and a gross infestation by *Aulacaspis rosae* (rose scale) was found on some blackberry plants consigned to a nursery. Neither of these scales is known to occur anywhere in South Africa. Among the fruit inspected, San José scale was in abundance on some Californian pears. During this period the sorting of imported potatoes has been supplanted by fumigation in formaldehyde gas. The chambers at Cape Town were made 14 feet square and 8 feet high, and the cases were stacked three or four high, with about three inches of clear space all round them. The chambers were built with two wide doors one opposite the other and the charge of chemicals divided between two buckets. The charge consisted of 48 fluid oz. formaldehyde solution (nominally 40 per cent.) and 24 avoir. oz. of permanganate of potash crystals. The crystals were placed in the bucket and the liquid added. In about half the treatments, the exposure was overnight and the rest was generally four to five hours. No injuries to the potatoes were experienced by this treatment. No contraventions of serious importance of the "Codling moth Regulations" have been reported. As a result of the "Plant Removal Regulations", two rather large consignments of oak trees, infested with the pustular oak scale, were prevented from being despatched from Johannesburg to distant centres, and the finding of the ordinary red scale on fruit trees, roses and vines was of common occurrence. A detailed statement of the occurrence of San José scale is given, and precautionary measures are being taken to check the dissemination of this pest. Migratory locusts gave no material trouble in any part of South Africa during the period covered by this report.

YOTHERS (M. A.). **The peach twig-borer. An Important Enemy of Stone Fruits.**—*Washington State Agric. Expt. Sta., Pullman, Bull.* no. 61, 10th Feb. 1914, 4 pp., 5 figs.

Known in the United States since 1860, when it was introduced with the peach from Western Asia, the peach twig-borer or peach worm, *Anarsia lineatella*, Z., causes considerable damage not only to the peach, but to other stone fruit, such as prunes, apricots, nectarines, plums and almonds. The larvae hibernate in small silk-lined cells just beneath the surface of the bark, and located within the forks of small twigs. About the time the peach trees bloom in the spring, the young larvae emerge and, after a couple of days, eat their way into the tips of the

twigs. They not only eat the buds, but penetrate into the pith of the small twigs, causing the leaves to wilt and droop. One larva injures several twigs, and if infestation be severe, the tree may be killed. The second and third broods of larvae attack the fruit; they sometimes feed entirely in the flesh of the fruit, but often enter the stone. The pupal stage of the first brood is passed in crevices of the bark on the trunk of the trees, or under rubbish on the ground, etc. The adult is a tiny grey moth. The second and third broods of larvae pupate mostly in the creases at the stem end of the fruit. The eggs of the first brood are laid on the base of the petioles or stems of the leaves, those of the second on the fruit, while those of the third are laid in the crevices of the bark in the forks of new and old growth.

This pest is subject to control at least twice in its seasonal life. It can be reached by a contact spray while in its cell beneath the bark, and it can be killed by a stomach poison when it begins feeding upon the leaf bud in the spring. The contact poison should be applied just before the buds swell in the spring. The later the application is made before the buds open the better. Spraying for the San José scale will also control the twig-borer, if started as late as possible when the buds begin to swell. Thoroughly applied lime-sulphur solution is considered to be the best treatment for the twig-borer. Crude oil emulsion has not been tested thoroughly against it, but in view of the perfect results obtained with this preparation against the San José scale, it appears to be a very promising remedy for the borer. Kerosene emulsion has been supplanted by lime-sulphur. Lead arsenate (1 lb. in 50 gals. water) is effective when the over-wintering larvae begin feeding on the young buds in spring, but as the buds grow quickly, the poison is effective for only a few days, after which it must be renewed. Many of the larvae and pupae can be caught by banding the trunks as for the codling moth, and the bands should be examined weekly during the season. In the author's opinion, where regular spraying for the San José scale (either with lime-sulphur or crude oil emulsion) is practised each year as stated above, the injury of the peach twig-borer will be reduced to a minimum and further treatment usually unnecessary.

MAISONNEUVE (P.). **Le Froid et les Insectes Parasites de la Vigne.** [Cold and Insect Pests of the Vine.]—*Rev. Vitic., Paris*, xli, 12th Feb. 1914, pp. 179-182.

Numerous observations have proved that many insects can resist intense cold, and *Clysia ambiguella* and *Polychrosis botrana* are capable of resisting very low temperatures. It seems as if warm wet winters are more detrimental to these insects, for under these conditions, fungi develop and attack the pupae. Decortication is carried out in some vineyards and by this means many pupae are destroyed, but owing to the unprotected condition of the vines during winter, a great loss often results from this measure.

MORRIS (O. M.), HALL (J. G.), & YOTHERS (M. A.). **Potato-growing in Washington.**—*Washington State Agric. Expt. Sta., Pullman, Popular Bull.*, no. 62, 15th Feb. 1914, 39 pp., 18 figs.

Of the insects affecting potatoes in Washington, the potato flea-

beetle was one of the most serious pests in 1913, not only on account of the direct injury caused, but because that injury affords a point of entrance to the fungous disease of the potato, known as early blight. The most effective treatment for this insect is to spray the plants with Bordeaux mixture. The latter serves merely as a repellant. Wire worms primarily infest grass, but are not adverse to feeding upon potato tubers and often do considerable damage by boring through them. The best method of control, so far devised, is autumn ploughing to destroy the over wintering pupae in their cells in the ground. Cut worms are not especially fond of potatoes, but often do considerable damage. No method seems to give perfect control results, but clean culture is one of the most effective remedies and if consistently followed will give a good measure of success. A very common and effective treatment is to poison the worms with the poisoned bran mash recommended for grasshoppers. Several species of grasshoppers injure the potato by destroying its leaves and stem. In certain districts along the Columbia and Snake Rivers, there was a most serious outbreak of this pest in 1913. Fortunately the early potato crop was well advanced by the time the insects swarmed into the fields and gardens, but in many cases the late potatoes suffered severely. Where grasshoppers are already in the fields, orchards and gardens, the best method is to kill them with a poisoned bran mash, one formula being: Bran 25 lb., syrup 1 gal., Paris green 2 lb. The Colorado potato beetle was found quite commonly in many parts of Eastern Washington during the summer of 1913, thus being, at last, established in the State. Both Paris green and lead arsenate are effective poisons, the latter being perhaps preferable. Another introduction of recent years is the potato tuber moth, or potato worm, which, for several years, has been the worst potato pest in California. With this, as indeed with most other pests, clean culture is a most important method of control.

GIRODAY (B. de la). **L'Artichaut dans la Gironde.** [The Artichoke in the Gironde.] *La Vie Agric. Rur., Paris*, iii, no. 12, 21st Feb. 1914, pp. 331-335.

In this article the author gives an account of the intensive production of the artichoke in Gironde, describing the varieties grown and methods of cultivation. In a paragraph on the natural enemies of this crop the author notes that the larvae of a *Vanessa* butterfly [doubtless *Pyrameis cardui*] invade the fields of artichokes in great numbers and entirely devour the leaves and fruit. Tobacco decoctions are of value in protecting the young plants, but cannot be used for older plants, since they impart to the fruit the odour of tobacco, rendering them useless for food. This pest disappears in a few weeks and several years may pass without any further attacks. The green Cassid beetle, though it does not cause such serious damage as the butterfly, renews its attack every year. The larvae are very resistant to insecticides and the adults eat the leaves of the plants and greatly reduce their value. Since the eggs are laid early, it is possible to treat with nicotin before the plants have developed much. The ravages of this pest are checked by the rains, whilst very warm dry periods are favourable to it.

GRAF (J. E.). **A Preliminary Report on the Sugar-Beet Wireworm.** *Bur. Entom. U.S. Dept. Agric., Washington, D.C., Bull.*, no. 123, 28th Feb. 1914, 68 pp., 23 pls., 9 figs.

The sugar-beet wireworm, (*Limonius californicus*, Mannh.), has been a more or less destructive pest on sugar-beets since they were first grown in California, and prior to that time was known as an alfalfa and maize pest. It may be considered the worst insect enemy of the sugar-beet, because it is constant, appearing every year to a greater or less extent, and its injury occurs in such a manner that replanting is generally impractiable. The beet is killed, since the wireworm cuts into and injures the root. This insect is most injurious while the beets are young and is destructive only in the larval stage. Other beetles occur with the sugar-beet wireworm, e.g., *Drasterius livens*, Lec., *Cardiophorus aeneus*, Horn, and *C. crinitus* (?); *Platynus* sp. has been commonly noted and also *Blapstinus* sp. and a species of *Coniontis*. Among the food-plants recorded, the larvae have been noted on wild beet, potato, Lima bean (all varieties), maize (all varieties), Johnson grass (*Sorghum halepense*), dock (*Rumex hymenosepalus*), alfalfa (*Medicago* spp.), pigweed (*Amaranthus retroflexus*), nettle, wild aster and Mustard (*Brassica niger*). Oviposition takes place during the spring, mostly in April; a loose damp soil is selected and nearly all the eggs are placed in the top inch and a half of soil. A small mite *Parasitus* (*Gamasus*) *coleoptratorum*, L., was commonly observed with the eggs. Each female may deposit about 100 eggs, and these hatch in about 15 to 25 days. The exact length of the larval stage is not known, but from experiments it seems that it could not be less than three years. After emerging from hibernation the wireworms feed on the old beets until they can obtain young beets. The pupal stage lasts for about a month. Old beet-roots are the favourite food, and the larvae are only occasionally found at the roots of alfalfa, Johnson-grass, wild beets and young beets. In the experiments recorded, none of the beetles were very active after 15 days, and after 25 days they became very feeble. Under field conditions 75° F. to 80° F. seems to be the optimum temperature for their various activities, and most adults show remarkable ability to withstand physical injuries or sudden and unfavourable climatic conditions, such as great changes in temperature and several severe rainstorms in succession. They pass the severest part of the winter in the soil and the time of their appearance in the spring is influenced to a large extent by artificial agencies such as spring ploughing. Thus prematurely driven to the surface, they seek "secondary hibernation" under almost any shelter. On becoming active they remain relatively near the hibernating quarters, but are disseminated by the occurrence of strong winds and floods.

The wireworms have several important natural checks. Nearly all insectivorous birds eat them, and the Carabids or ground-beetles, dispose of large numbers. The adults are also at times severely attacked by a fungous disease. No efficient parasite has yet been found for this pest, though a bacterial disease is often present. On the whole, the larvae of *L. californicus* are very little affected by their animal enemies, or by fungous or bacterial diseases.

Experiments were made to test remedies for the sugar-beet wireworms. Those depending upon the use of poisoned bait were far from

satisfactory—the wireworms showing little ill effect from eating the bait. The poisons used were lead chromate, potassium cyanide, strychnine, Paris green, lead arsenate and zinc arsenite. A fairly exhaustive series of experiments was carried on, using 19 repellent substances against the larvae. None however gave results which would justify recommending them as a deterrent. In one case the land was dressed with a solution of potassium cyanide. By this method the cyanide is used sparingly and its killing power was very good, but it remains to be seen whether a suitable strength of cyanide can be found which will kill the wireworms, without harming the beets. The destruction of the pupae by cultivation has been recommended, but in order to be effective, the autumn ploughing would have to be quite deep (9 to 10 inches). Experiments with guano fertilizer show that it would be impracticable for ordinary use. No doubt much of the injury to the beets may be avoided by early planting, as this gives the roots a good start before the wireworms are doing their most extensive feeding. Clean culture against the adults, by compelling them to seek shelter elsewhere and exposing them to the attacks of their bird enemies, seems to be the most practical remedy found thus far for this insect. Old beet tops are left to act as a fertilizer and are supposed to be ploughed under, but by the time the land has been harrowed several times many appear on the surface again. All old tops should be cleared away, and the efficiency of this remedy would be increased if autumn ploughing and early planting were combined with it.

BAGRINOVSKY (—). **О борьбѣ съ вредными насѣкомыми въ Куликовскомъ лѣсничествѣ Тамбовской губерніи за 1913 годъ.** [The fight against injurious insects in the Kulikov Forest of the Government of Tambov in 1913.] — **«Лѣсная жизнь и Хозяйство.»** [*Forestry life and Economy*], *Tambov*, no. 6, March 1914, pp. 6-10.

Melolontha adults were not abundant in 1913, and owing to spring frosts, very few emerged until the middle of May. The collection of beetles organised in the Forests which lasted till the 20th May, produced over half a ton of beetles, which, it is calculated, contained 335,296 females. A table showing the amount of beetles collected daily is given. The premium paid for the collections was at first about 1½*d.* per lb., but owing to the small number of beetles, it was found necessary to increase this figure to about 1¾*d.* The total cost of collection, in which some 130 people, mostly women, were employed, was £8 16*s.* The work was done principally between 10–11 a.m. although some women collected the whole day; the area over which the collections were conducted was not more than 6,750–8,100 acres. Other purposes necessitated an expense of £3 12*s.*, so that the total cost of the campaign was £12 8*s.* Judging by digging operations, undertaken to ascertain the prospects of the numbers of adults in 1914, even less than in 1913 may be expected, as nearly all the larvae found were of the first and second year, only occasional specimens of three-year old larvae being observed.

An experiment has been started to ascertain the amount of damage done by the larvae to trees of various ages, and the ability of the trees to withstand the damage; four pines and one oak were surrounded in autumn with a trench and about 1000 larvae were brought into the enclosure and left there.

A flight experiment was also undertaken by Prof. I. K. Tarnani; about 1,000 beetles were marked with anilin blue and black varnish and released in a field 2–2½ miles away from the forest; but no marked beetles were found amongst those collected. The experiment was repeated by V. P. Shugaiev with inconclusive results.

The collected beetles were dried either in a seed drying room, where they perished rapidly from the high temperature, or in a special oven, and they were afterwards ground to powder in a special mill. Samples of this powder were sent to Professor Tarnani of Novo-Alexandria for analysis, in order to ascertain whether it can be used as manure.

Trenching of the ground was undertaken to ascertain the results of the collection of the adults upon the numbers of the larvae in the soil: the good results of these operations will appear in the report of Professor Tarnani. During the work, some diseased larvae were found and sent to the Phytopathological Bureau of St. Petersburg, and in one case, the infection of the larva with *Botrytis bassiana*, Bos., was established.

RUTHERFORD (A.). **Some Notes on** *Xyleborus fornicatus*, **Eichh.**, (Shot-Hole Borer). *Trop. Agric., Peradeniya*, xlii, no. 2, Feb. 1914, pp. 220-222.

In this paper the author records several experiments he has made with a view to determining whether, in burying prunings as a control against *Xyleborus fornicatus*, Eichh., the beetles are killed or are unable to reach the surface of the soil. Infested twigs were first kept under observation, and from these it was found that the proportion of males to females is one to five and in a larger count, 1 to 12·25. In each gallery in the twig the number of immature insects is from 6 to 10 in a vigorous colony, or may be as high as 17 or 18. Experiments were next made regarding the method of control. In the first place several beetles were placed in a glass jar and covered with earth to a depth of nine inches: this was found to present no formidable barrier to their emergence. In other experiments infested twigs of tea were placed in two cylinders and covered with 7 and 5½ inches of soil respectively. After 30 days, the contents were examined, the twigs showed a growth of white fungus and below the bark, the wood was almost black. Beetles were still present and thriving, though some had been observed on the surface of the soil and probably some had escaped through holes eaten in the muslin cover. On 30th October twigs were buried in a similar manner with slaked lime. No beetles had been seen by 7th November, but when the twigs were examined, living beetles and larvae were found. Some of the twigs were left in the cylinders, and it was found that slaked lime had failed to kill the larvae after an exposure to it of 23 days. Quicklime was next used, but, as with the slaked lime, the beetles, under laboratory conditions, continued to breed in prunings that were far gone in decay, provided these are not too dry, and were able to work up through as much as 7½ inches of

fine earth mixed with the lime. It was also found that in prunings left on the surface of the ground for as many as 13 days, adults and even pupae may remain alive. Dipterous puparia and larvae are not infrequently found in the tunnels of *X. fornicatus*, but even if they prey on the shot-hole borers, the extent to which they do so is practically negligible; beetles and their larvae and their eggs have been found in many galleries that contained maggots. It is clear that the maggot is an unwelcome tenant of the gallery, but it may merely eat the fungus which forms the food of the beetle and thus serve to diminish the number of beetles reaching maturity. Other insects have been encountered on rare occasions in the tunnels. In the light of present knowledge, the means of control recommended are, the burning of prunings, discovery and elimination of breeding grounds in plants other than tea, cultivation and manuring, and prevention of the infestation of fresh areas. *X. fornicatus* is now known to occur in many localities in Ceylon, a list of which is given.

RUTHERFORD (A.). **Tea and Citrus Mites.** *Trop., Agric. Peradeniya*, xlii, no. 3, March 1914, pp. 225-229.

The author in this paper records the occurrence in various localities of the following mites, *Brevipalpus obovatus*, Donn, *Tetranychus bioculatus*, Wood Mason, and *T. mytilaspidis*, Riley, and gives a description of them. *B. obovatus* is a common and widely distributed pest of tea. The mite lives in colonies on the under surface of the leaf and Green has recorded cases in which whole bushes have been almost denuded of leaves and even killed as a result of the work of this pest. Under the name of *Tenuipalpus californicus*, Banks describes a mite bearing a striking resemblance to *B. obovatus* which occurred in California. The author has also observed *B. obovatus* on citrus trees. *T. bioculatus* attacks chiefly the upper surface of the leaves, but does not prove so injurious in Ceylon as the other mites of tea. Green records this mite from Camphor and Grevillea, and the author has seen it on *Eugenia jambos*. The author has recently found on Citrus in Ceylon, the Citrus Red Spider (*T. mytilaspidis*, Riley) of California. It was first described from orange in Florida in 1885, and is capable of doing considerable injury.

HEWITT (C. G.). **The Protection of Birds in and around Ottawa.** *Ottawa Naturalist, Ottawa*, xxvii, no. 12, March 1914, pp. 161-17[illegible], 2 figs.

After drawing attention to the enormous amount of damage done to crops, etc., by insects, the author gives some account of way in which birds may be used as a controlling factor and adduces figures to show that the work they may do, in destroying insects, is very considerable. Insects constitute 65 per cent. of the total yearly food of woodpeckers 96 per cent. of that of fly-catchers, and 95 per cent. of that of wrens. Upwards of 5,000 insects have been found in the stomach of a single bird. The value of the birds is increased by the fact that, at the time when insects are most abundant, birds are most active and require more food, especially animal food, to feed their young; a pair of tits and their young will consume about 170 pounds of insects during a year.

The American robin (*Planesticus migratorius*) probably appears earliest in the year; its food consists largely of cutworms. The blue bird (*Sialia sialis*) is not so common in the Ottawa district; insects, such as grasshoppers, beetles, and caterpillars, constitute about 68 per cent. of its food. Wrens, such as the house wren (*Troglodytes aedon*), chicadees (*Penthestes atricapillus* and others), martins (*Progne subis* and others), the tree swallow (*Iridoprocne bicolor*), two of the woodpeckers (*Colaptes auratus* and *Dryobates pubescens*), etc., are readily attracted by nesting boxes, of which various forms are described. Such boxes are not costly, and experience has shown that they help to solve the problem of destroying various pests.

GREENE (C. T.). **The Cambium Miner in River Birch.** *Jl. Agric. Research, Washington*, i, no. 6, March 1914, pp. 471-474, 2 pl.

The fly *Agromyza pruinosa* belongs to a family of leaf and stem miners, but is remarkable in that it mines in the cambium; the mine leaves a scar known as the "pith-ray fleck," and on birch trees in Europe it is the work of *A. carbonaria*. *A. pruinosa* has been reared from birch trees in America, and similar, if not identical, species have been found on red maple (*Acer rubrum*) and wild cherry. The trees attacked are outwardly healthy, and the damage can only be seen on exposing the cambium, which shows the galleries made by the insect. Larvae, kept in jars containing earth and sand, emerged as adults at the end of April and the beginning of May. The larvae emerge from the roots and pupate in the earth. A hymenopterous parasite of the miner has been reared; this parasite, *Sympha agromyzae*, lays its egg in the egg of the host: no sign that the host is parasitised is recognisable until after pupation, when the parasite emerges from the pupal case of the dipteron.

KNAB (F.). **On the Genus** *Cryptochaetum.—Insec. Inscit. Menstruus, Washington*, ii, no. 3, March 1914, pp. 33-36

The author revises the Cecidomyid genus *Cryptochoetum*, which is important in that it contains species which are parasitic on scale-insects and have been used in America for their control. The species referred to and described are *Cryptochoetum iceryae*, Williston, and *C. monophlebi*, Skuse, both formerly placed in the genus *Lestophonus* and parasitic on *Icerya purchasi*, and *C. curtipenne*, sp. n., bred from the scale-insect *Walkeriana* (?) *kandyense* in Ceylon.

CRAWFORD (J. C.). **Three New Hymenoptera** (*Chalcidoidea*).—*Insec. Inscit. Menstruus, Washington*, ii, no. 3, March 1914, pp. 36-38.

Three new species of Chalcid parasites are described: *Pachyneuron hammari*, bred from codling moth at Rosewell, New Mexico; *Cyrtogaster glasgowi*, reared from puparia of *Brachydeutera argentata* at Urbana, Illinois; and *Pleurotropis testaceipes*, from a leaf-miner on an undetermined plant at Batesburg, S. Carolina.

HOOD (D.). Two Porto Rican Thysanoptera from Sugar Cane.—*Insec. Inscit. Menstruus, Washington*, ii, no. 3, March 1914, pp. 38-41, 1 fig.

Two species of thrips, *Heliothrips femoralis*, Reuter, and *Haplothrips* (?) *tibialis*, sp. n., are recorded as occurring on sugar-cane in Porto Rico; they are both additions to the list of insects known to affect that plant as well as to the known Thysanopterous fauna of the island.

COCKERELL (T. O. A.). A New Coccid from Arizona.—*Entom. News, Philadelphia*, xxv, no. 3, March 1914, p. 110.

A new species of Coccid is described under the name *Palaeococcus morrilli*. It was taken on a plant resembling, though not identical with, *Viborquia spinosa*.

Forest Insect Ravages stopped.—*Ind. Forester, Allahabad*, xl, no. 3, March 1914, pp. 117. [Extract from *American Forestry*.]

By a prompt campaign against a colony of bark beetles (SCOLYTIDAE) in the Ochoco National Forest in central Oregon, a danger which threatened to destroy millions of feet of timber was eliminated. To combat this pest the usual method, recommended by the U. S. Bureau of Entomology, is to remove the bark of infested trees between October and July, while the larvae are still in the tree; this is sufficient to kill them and the timber may be sold while it is yet sound. In the Ochoco Forest there was no market, and the forest officers found that the cheapest and most effective method of control was to cut the trees and burn them before the new broods of beetles could emerge. In 1912 the infestation was given a decided check by the cutting of 3,500 trees. In 1913, 40,000 trees were cut, and as a result of these measures the beetles are under control.

Control Work against Forest Insect Depredations in the Hetch-Hetchy Watershed of the Yosemite National Park.—*Entom. News, Philadelphia*, xxv, no. 3, Mar. 1914, pp. 132-133.

Investigations have shown that as much as 95 per cent. of the timber in some of the canyons and valleys of the Tuolumne River, has been killed by bark-boring insects. This condition, affecting the scenic beauty of the north of the Yosemite Valley and its consequent effect on the water supply and general economy of the Hetch Hetchy project presented an important problem, and arrangements were made to combat the beetles. Two acres were marked off, and on one, measures were taken during July, before the beetles would have begun to emerge from the bark; the second area was treated in September and at the beginning of October, at the time when the beetles coming from the overwintered broods had entered the bark. The measures taken were to fell the infested trees, lop off the limbs, pile them on the trunks and set fire to the whole; this scorched or burned the bark sufficiently to kill the insects. The trees thus treated, 1,671 in all, ranged in diameter from 6 inches to 54 inches, the average being about 22½ inches. The cost was about £240. It is estimated that a further outlay of about £100 will suffice to bring the beetle quite under control. The insect responsible for the death of such a large percentage of lodgepole pine

timber in the northern section of the park is the mountain pine beetle (*Dendroctonus monticolae*). It attacks healthy trees and kills them by mining between the bark and wood so as to stop the movement of sap, which results in the death of the tree within 10–12 months after it is attacked.

JABLONOWSKY (J.). **Recent Work of the Royal Entomological Station of Hungary.**—*Mthly. Bull. Agric. Intell. Plant. Dis., Rome*, v, no. 3, March 1914, pp. 316-320.

In 1913, the most troublesome pest in Hungary was the corn ground beetle (*Zabrus tenebrioides*, Goeze) which injures the cereals in autumn, attacking the seedlings, and if the winter be mild continues its ravages up to the beginning of May. Spraying, with an ordinary knapsack-sprayer, with a nicotin mixture made by dissolving 2 oz. of sulphate of nicotin and 1¼ lb. of soft soap in 10 gallons of water, was effective in killing all the beetle larvae. Healthy, as well as attacked, plants should be treated and the earlier the spraying is done, the more effective is its action and the lower the cost. The cereal or barley leaf beetle (*Lema melanopus*) is a sporadic pest of barley and oats, attacking their leaves in the early spring, and causing the plants to dry before the proper time and yield no seed. Catching the insects by means of nets and also destroying the larvae with a spray, were found to be efficient methods of control. Spraying is more satisfactory in dry weather, the formula given being, 4 lb. of nicotin sulphate and 15 lb. of soft soap to 100 gallons of water.

Other experiments were conducted on a larger scale, with sulphate of nicotin, against the caterpillars of *Clysia ambiguella* and *Polychrosis botrana*, which cause as much injury to vines in Hungary as elsewhere. Sprays containing 2 oz. of nicotin (either sulphate or extract) and 1½ lb. of soft soap to 10 gallons of water, or Dr. Jean Dufour's mixture composed of 1½ lb. of pyrethrum powder and 3 lb. of soft soap to 10 gallons of water, were used, and the experiments showed that 98 to 99 per cent. of the larvae were destroyed, provided that the following conditions were observed:—(1) that the control be commenced at the most favourable moment for the hatching of the caterpillars (in Hungary in 1913 it was after May 24th); (2) that the spraying be carried out under high pressure; (3) that the bunches be sprayed on both sides; (4) that the solutions be composed of insecticidal substances (nicotin and pyrethrum) and of substances capable of removing fat (soap). Experiments were undertaken against the caterpillars of the grape moth (*Oenophthira pilleriana*); the best results were obtained by a combination of hand-picking at the time when the young shoots were beginning to be attacked, and a subsequent spraying with Bordeaux mixture to which ½ lb. of lead arsenate had been added to every 10 gallons of mixture; what the ultimate result of this method will be as regards efficiency is uncertain.

Cockchafers (*Polyphylla fullo*) have caused much damage in vineyards; hand-picking of the larvae was the method of control practised; the insect has a preference for the Scots Pine (*Pinus sylvestris*), Corsican pine (*P. laricio*), Austrian pine (*P. austriaca*) and black spruce (*Picea nigra*), and these were introduced into the vineyards; the insects are attracted by them, and are more easily collected from them, than from most other trees.

Work was done on the use of lime-sulphur mixture. In spite of the fact that it is very effective against *Lecanium*, its adoption in Hungary is not likely to be very rapid, because (1) its preparation is lengthy; (2) it does not always succeed, on account of the varying nature of the different quicklimes of the country; (3) its preparation is not carried out on a large scale in Hungary, nor at a low price and (4) the practice of spraying fruit trees with carbolineum (15 lb. of carbolineum to 10 gallons of water) is constantly gaining ground.

PICARD (F.). **A propos de l'action du froid sur les insectes.** [The action of cold on insects.] *Progrès Agric. et Vitic., Montpellier*, xxxi, no. 11, 15th March 1914, pp. 332-333.

Insects may be divided into two classes, according to the manner in which they pass the winter. Some are in a latent state, either as eggs, larvae or pupae, while others lead an active existence and feed as they do in summer. This is the case with a fly, *Agromyza abiens*, found in artichoke and cardoon gardens in the South of France and which the author has been studying for some time. Its larvae are very voracious and cause much damage, but about the middle of January last, when the temperature fell to 6°F., they practically all perished, and examination led to the conclusion that the death was due to cold. This species does not hibernate, and is therefore unable to resist rigorous temperatures.

The author remarks that "woolly bears" (the larvae of *Arctia caja*) will be less abundant this year than last, because nearly all were destroyed last season by *Empusa aulicae*. On the other hand, it is very doubtful whether the fungus *Beauveria globulifera*, which requires a mild and damp winter, will have been able to kill many of the vine flea-beetles (*Haltica ampelophaga*). A severe winter will therefore have been harmful in this sense.

GIRAULT (A. A.). **Hosts of Insect Egg-Parasites in Europe, Asia, Africa and Australasia, with a supplementary American List.** *Zeitschr. wissen. Insektenbiol., Berlin*, x, no. 3, 15th March 1914, pp. 87-91.

A list is to be given, of which the present paper is the first part, of the insect hosts of egg-parasites as yet recorded from the areas indicated, and the American list drawn up by the author (1907, 1911) is supplemented. The present part includes nearly 80 species.

ZACHER (F.). **Papilios als Schädlinge der Agrumen.** [Papilios as citrus pests.] *Entom. Zeitschr., Frankfurt a. M.*, xxvii, nos. 50-51, 14th & 21st March 1914, pp. 288-289, 295-296, 5 figs.

Few Papilios are of economic importance, but the caterpillars of these show a preference for the hard, shiny leaves of citrus trees throughout the world. The African *Papilio demodocus*, Esp., lays single eggs on the underside of a leaf. Many eggs are laid on unsuitable plants, or even on dry wood, but always in the immediate vicinity of orange trees, so that the strong smell emanating from the latter is supposed by Vosseler to provoke oviposition. This species increases rapidly and does not appear to suffer from enemies and

parasites. Riley states that the North American *P. cresphontes*, which has the same habits, is avoided by nearly all birds. In India and Arabia, *P. demoleus*, L., is found in place of *P. demodocus*, Esp. In China and Japan the citrus-injuring Papilios are represented by *P. xuthus*, L., and *P. demetrius*, Cram., and in Australia by *P. aegus*. In the Malay Archipelago *P. memnon*, L., is the species which attacks citrus plants. *P. polytes*, L. (=*pammon*, L.), which is smaller than *P. memnon*, is found in British India and the Sunda Islands. In Florida and Cuba, orange and other citrus-trees are attacked by the caterpillars of *P. andraemon*, Hb., and *P. thoas*, L. The injury done to citrus plants by Papilio caterpillars may amount to complete defoliation, with resultant loss of the crop. The collection by hand of caterpillars and pupae is advisable, but if the trees be too big or the plantation too extended, spraying may, exceptionally, become necessary. A solution of $\frac{1}{2}$ lb. lead arsenate in 50 gals. water should be used, and care must be taken to stir the spray solution to prevent the poison from settling.

VASSILIEW (I. V.). **Вредители хлопчатника въ Ферганѣ по наблюденіямъ 1913 года.** [Pests of cotton in Fergana, according to observations made in 1913.]—**Труды Бюро по Энтомологіи Ученаго Комитета Глав. Управ. З. и З.** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Adminstration and Agriculture.*] *St. Petersburg*, x, no. 10, 1914, 23 pp., 13 figs.

The pests of cotton in Russian Central Asia and in Transcaspia are still little known, notwithstanding the fact that the cultivation of cotton in Turkestan is increasing from year to year. The author was sent by the Bureau of Entomology of the Central Board of Land Administration and Agriculture to study these pests and here gives the results of his observations in 1913 in Fergana, which province is the principal cotton-growing district of Russian Turkestan. The following pests were observed: *Thrips flavus*, Schr., is injurious to cotton both in the adult and larval stages and was found as early as the middle of April, when the insects attack the first pair of leaves, causing smooth, shining, light spots of irregular form; such injuries are not as a rule fatal. When the first true leaves appear, the insects attack them, chiefly at their base or near the main veins. This may cause the leaves to fall off, but, in some cases, the damage leads only to deformation. The insects then move to the more developed leaves, and several individuals may be found at the base of each leaf, mostly at the point where the main veins separate; the tissue of the leaves on these spots turns brown and withers. With good cultivation the effects of the damage are less noticeable. *T. flavus* is widespread in Fergana, and in the middle of June, the proportion of injured plants on the fields of the Agricultural Station in the Starvation Desert was 40–50 per cent. Sometimes these insects occupy leaves on which are colonies of *Tetranychus telarius*, and these mites are evidently destroyed by the *Thrips*, which establish themselves underneath the webs formed by the mites. *T. flavus* was also found by the author on *Atriplex* and on plums. A solution of green soap was used as an insecticide against the *Thrips*, about $\frac{1}{2}$ lb. of soap being dissolved in about 2·7 gallons of

water. After the first spraying 40 per cent. of the insects perished; the second spraying raised this figure to 80 per cent.; the young plants which at the time of spraying (25th–26th June) had two or four true leaves, did not suffer from the insecticide.

Euxoa (Agrotis) segetum, Schiff., appeared at the same time on the cotton fields of the Station of Adijan. During the daytime the young larvae eat the parts of the plants below the surface of the soil, the larger individuals dragging other plants into their holes; at night they gnaw the cotyledons of the seedlings. These larvae also feed on certain weeds common on cotton plantations in Fergana, such as *Convolvulus*, *Malva rotundifolia* and *Plantago*; they also attack maize. These larvae did considerable damage at Pachtalykulsk, to a new variety of cotton brought by A. N. Liubtchenko from America and sown for experimental purposes to obtain hybrids. The percentage of damaged crops on some fields was 80–90 per cent.

Aphis gossypii, Glov., appeared after the beginning of May. At first only small colonies of winged and wingless specimens were found, but after June, the numbers grew rapidly. The progeny of winged individuals were of a yellowish or brownish-green colour and occupied the lower sides of the leaves; those of wingless parents were blackish-brown and rested mostly on the stalks and buds of the cotton plant. From the beginning of July the migration of the aphids began and then the injuries caused by them became obvious. The injured plants had an unnatural, shining appearance. The author attributes to these insects the dropping off of the buds and young bolls, which is usually ascribed to the influence of dry winds or lack of water. The injuries caused by aphids also favoured the growth of a fungus (*Capnodium*) which develops on their excreta.

At the beginning of July, the author discovered on cotton some predaceous insects which destroyed the lice, such as the larvae of *Syrphus*, *Leucopis*, *Chrysopa*, *Coccinella 7-punctata*, L., *C. 18-punctata*, Scop., *Adonia variegata*, Goeze, and other species; also a Braconid of the genus *Aphidius*, which proved very effective in destroying the pests. About the middle of July some new enemies appeared in the form of larvae of *Aphidoletes* and of *Triphleps albidipennis*, Reut., and a parasite, of the family PTEROMALIDAE, replaced the Braconid. Each female of *Aphidius* in captivity attacked only 3 to 4 aphids and infested only the wingless forms. The adult parasites lived for a week in captivity before ovipositing, being fed on honey. At the beginning of July the same aphids were also found on melons and pumpkins when these plants were situated near cotton fields, also on *Hibiscus trionum*, L., a weed belonging to the same family as cotton. The activity of all the natural enemies effected a marked decrease in the numbers of the lice, and by the middle of August it was difficult to discover specimens near Andijan, although round Skobelev, small colonies existed even in September.

Besides *A. gossypii*, another aphid, which has just been described by Mordwilko and named *Acyrthosyphon gossypii*, Mordw., was found on cotton; it is similar to *Aphis pisi*, being distinguished from it, amongst other characters, by its longer proboscis. The author first discovered small colonies of these aphids, consisting of wingless viviparous females and larvae of various ages, on the 29th June near Andijan; a month later the numbers of this species were much greater

and the colonies contained winged and wingless forms and were found on the lower sides of leaves in company with *A. gossypii*, but there was no sign that they were injuring the plants.

Tetranychus telarius, L., was first observed by the author on cotton seedlings on the 25th June, near Skobelev. A month afterwards the presence of this mite was more noticeable owing to the appearance of purple-red spots on the leaves of the cotton. The colonies of *T. telarius* usually appear on the lower sides of the leaves, living beneath a web. The purple spots produced by them are chiefly peculiar to American varieties of cotton, e.g. *Gossypium hirsutum*, while the local sort, *G. herbatium*, does not exhibit them; this is explained by the presence of a red juice in the leaves of American cotton, the Russian cottons having a practically colourless juice. The local varieties are more liable to the attacks of this pest, loss of leaves occurring more frequently in their case. Occasionally there is an extraordinary growth of the colonies and the whole plant is then covered with the web. Amongst the enemies of *T. telarius* are mentioned: *Scolothrips sexmaculatus*, Pergande, larvae of *Aphisoletes*, larvae, nymphs and imagos of *Thripleps albidipennis*, Reut., and the larvae and imago of *Scymnus punctillus*, Ws.

As a remedy, the author has tried a solution of wheat paste; 1 lb. of wheat flour to 8 gallons of water, the flour being first made into paste in the usual way. He described his experiments with this remedy and with flowers of sulphur, and it appears that the former proved much more effective; it is cheaper, 3 gallons costing only about ¾d., and kills the mites in a very short time (1½ to 2 hours), by smothering them; while the second remedy causes death only after a few days, a certain percentage of the mites escaping.

Acridium aegyptium, L., were discovered at the end of June in the larval stage on cotton leaves. The larvae, as well as the nymphs, feed principally on cotton, while the imago feeds on the foliage of bushes and fruit trees. In captivity the emergence of the insects began on the 7th September, indicating that *A. aegyptium* winters in Fergana as an imago, which is also the case in the Crimea. In Andijan, 10 per cent. of the plants were sometimes injured. The same pests were also noticed in Pachtalykulsk and in the Starvation Desert.

At the end of July, injury to cotton by *Pandemis* (*Tortrix*) *chondrillana*, Hs., was first observed. The larva draws the leaf into a tube and skeletonises it, destroying as many as 3 to 4 leaves during its life; it also attacks the buds. *P. chondrillana* has two broods during the summer.

In July, damage to the leaves of cotton by *Acronycta rumicis*, L. var. *turanica*, Staud., was observed in Pachtalykulsk. The young larvae eat away the parenchyma of the leaves, not touching the epidermis; later on they gnaw round holes through the leaves, leaving the main veins untouched. Such injuries were mostly observed on cotton growing near plantations of poplars or willows. Nearly all the larvae collected were infested by *Anilasta* sp.

Adelphocoris lineolatus, Goeze, was frequently found on cotton in Andijan, especially where the plantations of cotton joined lucerne fields. This pest sucks the pedicles, stalks and leaves of cotton, causing in some cases the falling off of young bolls and buds. In captivity it was observed to oviposit on stalks of cotton. *Monostira*

inermis, Horv., although not living on cotton, but on leaves of willows and poplars, finds its way on to cotton and sucks the leaves, causing small pale spots. This was observed in the Starvation Desert at the beginning of August.

In the middle of July, a peculiar injury to cotton was noticed near Andijan, consisting of numerous light irregular spots, concentrated chiefly near the tips of the leaves. This injury was caused by *Chlorita bipunctata*, which was also found on small-leaved elms. With it occurred *Agallia sinuata*, M. Rey, which usually sucked the stalks and petioles of cotton, without however causing noticeable damage. Both species produce two generations during the summer.

During July and August, the maggots of a fly, *Agromyza flaveola*, Fall., were observed mining the leaves of cotton near Andijan and Akobelev; the imago appeared in the middle of August.

Single examples of *Chloridea obsoleta*, F., and *Laphygma exigua*, Hb., were also found by the author on cotton.

SUDEIKIN (G.). **Озимый червь и борьба съ нимъ.** [*Euxoa segetum* and the fight against it.] Reprint from **« Ежегодникъ Бобровской Уѣздной Земской Управы.»** [*The Annual Report of the District-Zemstvo of Bobrov.*] *Bobrov (Govt. of Voronezh)*, 1911 6 pp., 4 figs.

The author, in a popular form, describes the imago and larvae of *Euxoa segetum*, figuring both stages, and giving some general information as to its life-history and the injuries it does to crops. In the government of Voronezh, there are two generations, at the beginning of summer and in autumn. The larvae of the first generation injure "bachza" plants, beetroots and tobacco, while the second generation damages the seedlings of winter-sown grain. The author suggests as remedies: Trenches round the stripped patches of the fields, which may be made with a plough; poisoning the larvae by spraying with Paris green or by means of baits consisting of poisoned leaves of cabbage, beet, etc.; ramming the spots seriously injured, with heavy wooden rollers; ploughing deep in autumn and early in spring; collecting and destroying the larvae; destroying weeds, on which the imagines oviposit and which form the principal food of the young larvae before the grain begins to sprout; catching the imagines in troughs with molasses.

ROSSIKOV (K. N.). **Занятый паръ, какъ предупредительная мѣра борьбы съ озимымъ червемъ или бабочками озимыми совками.** [Occupied fallow land as a preventive against *Euxoa* (*Agrotis*) *segetum*, Schiff., and *Feltia* (*Agrotis*) *exclamationis*, L.]. **Труды Бюро по Энтомологiи Ученаго Комитета Глав. Управ. З. и З.** —[*Memoirs of the Bureau of Entomology of the Scientific Committee of the Central Board of Land Administration and Agriculture*, *St. Petersburg*, x, no. 7, 1914, 15 pp., 1 map.

The author has studied the question of "occupied fallow land" as a means of preventing the multiplication of *E. segetum* and *F. exclamationis*, and this is a report on his investigations conducted during the summer of 1913 on a dessiatine (2·7 acres) of layland, being a portion

of the fallow fields of peasants of a village in the Tzarskoselsky district of the government of St. Petersburg. The plot selected for experiment extended across the middle of the fallow fields, with a boundary strip on each side. The plot was divided into six parallel sections of various sizes, out of which three, the two border sections and one in the middle, were turned into "occupied fallow"; two, on both sides of the "occupied fallow" part of the middle, were kept in a state of "black fallow," i.e. repeatedly harrowed during the summer; while the sixth part was allowed to grow over with weeds, i.e. kept as "peasant fallow" or "green fallow." Some of these sections were divided from each other by boundary strips of over a foot wide, others had no boundaries; the borders of the roads passing on each side of the plot were overgrown with abundance of weeds.

The author records chronologically all the work undertaken on the fields, giving the dates when the sowing, harrowing, etc., was done on the individual sections. Two of the occupied fallow parts were respectively sown in the first half of June with vetches and oats, and with vetches and peas; the third "occupied fallow" was sown with "Ivanovsky rye." At the end of that month the "peasant fallow" was overgrown with *Rhinanthus cristagalli*, *Polygonum convolvulus*, *Cirsium arvense*, *Atriplex patula*, *Sonchus arvensis*, *Pedicularis palustris*, *Euphrasia officinalis*, *Fumaria officinalis* and other weeds.

The emergence of the perfect insects began after the 1st of July and, in order to attract them to the experimental plots, some troughs with molasses were put on the "occupied and peasant fallow." When the number of the imagines was at its maximum (from the 10th to the 23rd July), the troughs were covered with gauze to serve only as attraction for the moths, but not to catch them, as it was not desired to prevent oviposition. During the time that the moths were on the wing, the author and his assistant carefully searched the crops on the "occupied fallow" parts, but no eggs were found even on the weeds; the eggs of some of the pests were found on the vetches on these sections, mostly those of *Barathra* (*Mamestra*) *brassicae*, but none of *E. segetum* or of *F. exclamationis*. Examination of "occupied fallow fields" in some other parts of the district yielded the same negative result. Thus it is undoubtedly established that "occupied fallow fields" sown either with vetches, or with vetches mixed with other crops, prevent the moths from ovipositing and consequently check their multiplication. At the end of July, the vetches were mown and removed from the fields and all search for caterpillars of the pest in the soil in which these plants had grown, proved useless. Many eggs and larvae were found on the section grown over with weeds, the eggs being deposited not on the weeds, but on the straw of the not yet rotted dung; the black fallow parts also exhibited eggs, laid on the earth and on the straw of the dung; larvae were also found in the soil, although their numbers were much less than on the "peasant fallow." Besides searching the soil, larvae were also collected by means of baits with the same result. In August the whole experimental plot, with the exception of the one section sown with "Ivanovsky rye," was reploughed, manured with artificial manure and sown with rye.

Two weeks afterwards, when the seedlings appeared, the state of the various sections was as follows:—the crops on the "occupied

fallow" were quite uninjured, except near the roads and boundary strips; those on the "black fallow" (i.e. sections, which were kept in that state throughout the summer) showed considerably more injury from the larvae; while more than half the crops on the "peasant fallow" section were destroyed, and it is expected that before the arrival of cold weather, these will be totally ruined.

[BLACK fallow land means layland left unsown but constantly ploughed, in order to prevent the growth of grass and weeds.

GREEN (or Peasants) fallow land means layland allowed to grow over with weed grasses and used as pasture land in peasant agriculture.

OCCUPIED fallow land means layland sown with some annual plant, which either can be mown as grass (vetches with oats, turnips), or can be reploughed, the plants serving as "green manure" (vetches, buckwheat, white mustard).—ED.]

ZACHER (F.). **Die wichtigsten Krankheiten und Schädlinge der tropischen Kulturpflanzen und ihre Bekämpfung.** [The more important diseases and pests of tropical plants and methods of control.] Part I.—*Deutsche Tropen-Bibliothek, Hamburg*, x, 1914, 152 pages, 58 figs.

This volume is intended to serve as a handbook to those interested in the cultivation of plants and trees in the tropics and is divided into two parts, the first dealing with diseases of cultivated tropical plants in general, and the second with those which attack plants of special economic importance. In the first part parasites, insects and fungi are dealt with, predisposition and immunity to disease discussed, and methods of treatment, insecticides, etc., are given. The second more specialised part treats in detail of plants of special economic importance, namely, cotton, cacao, coffee and tea.

SILVESTRI (F.). **Viaggio in Africa per cercare parassiti di mosche dei frutti.** [Report on an expedition to Africa in search of parasites of the Fruit Fly.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric. Portici*, viii, 1914, pp. 1-164, 69 figs.

In 1912, at the request of the Board of Agriculture and Forestry of Hawaii, the author undertook an expedition to search for parasites of the Fruit fly, *Ceratitis capitata*, which had been introduced in 1910 into Honolulu and was threatening to become a serious pest. The climatic and other conditions of the Hawaiian Islands were favourable to the development and propagation of the fly and mechanical and chemical means of control had proved useless. It was therefore resolved to organise an expedition to discover its natural enemies and to introduce them into the infected areas. The author started in July 1912 for West Africa. It was resolved firstly to ascertain whether *C. capitata* existed in that country, south of Senegal, and, if so, whether it was attacked by special enemies which might be worth introducing into Hawaii; and secondly, in the event of *C. capitata* not being found, whether other species of the same genus or of the genus *Dacus* were available, the parasites of which might be suitable for experiment. The Canary Islands, Senegal, French Guinea, S. Nigeria, the Gold Coast, Dahomey, the Congo, Angola and South Africa were visited.

Various species of *Ceratitis* and *Dacus* were found, many of which occurred during the author's visit, in such reduced numbers as to make it seem certain that they are effectually controlled by inimical factors. The occurrence, distribution and life-histories of many of the species found are described. Certain Braconid parasites of the genera *Opius*, *Diachasma*, *Hedylus* and *Biosteres*, and Chalcids of the genera *Tetrastichus*, *Dirhinus* and *Spalangia*, and Proctotrupids of the genus *Galesus*, seem to be the most active enemies of *Ceratitis* in West Africa; bacterial and fungoid diseases were also observed. Some species of hymenopterous parasites attack several different species of *Ceratitis* and *Dacus*; parasites of *C. giffardi* and *C. anonae* were experimentally bred by the author on *C. capitata*, and developed to maturity. Living adults of *Opius perproximus*, *Dirhinus giffardii* and *Galesus silvestrii* from West Africa, *Opius humilis* and *Trichopria capensis* from South Africa, and *Diachasina tyroni* from Australia, were brought to Honolulu and bred there in large numbers and were then distributed to other islands of the group; but it is impossible to make any statements as regards the results of these introductions until the permanent establishment of the species has been proved. If *Opius*, *Diachasma*, *Dirhinus* and *Galesus* become acclimatised, a notable destruction of *Ceratitis capitata* may be hoped for. The details of the breeding and liberation of the different species are shown in tabular form.

The author recommended that if *Diachasma tryoni* does not become established on account of the small number of specimens introduced, a large number should be imported from Australia, the transportation of these parasites to Hawaii being very easy. The introduction of other Braconids of the genera *Diachasma* and *Biosteres*, parasites of *Anastrepha*, from Mexico and Central America is advised before any new attempts are made to introduce BRACONIDAE from Africa, because the distance of the latter from the Hawaiian Islands and the habits of the parasites make it difficult to transport them in good condition. A comprehensive bibliography is given.

VERESTCHAGIN (B.) **Кровяная тля въ Измаильскомъ уѣздѣ.** [*Schizoneura lanigera, Hausm.*, in the district of Izmail (Govt. of Bessarabia).] **«Садъ и Огородъ»** [*Orchard and Market-Garden*], *Moscow*, Feb. 1914, pp. 74-76.

The author refers to the history of the spread of this pest and describes its habits and the damage done by it. It appeared some 6 or 7 years ago, in the district of Izmail, in the Government of Bessarabia, whence it spread to some neighbouring districts, and has greatly multiplied during the last 2 or 3 years. In some parts it is impossible to find an apple tree which is free from it, though it has not been found on any other trees. The remedies applied by the peasant horticulturists consist in digging out the attacked trees, crushing the aphids; smearing the trees with milk of lime, some of them smearing also the more infested spots with some oily substance. The author recommends that the pest should be more energetically attacked in the future, and suggests, in addition to the foregoing remedies, spraying the soil, after the attacked trees have been removed, with (K_2CS_3) or with kerosene, cutting away and destroying the diseased branches and spraying the leafless trees with kerosene emulsion.

KOSTROVSKY (Karl). **Сливяная плодожорка, ея жизнь и мѣры борьбы съ нею.** [*Cydia* (*Grapholita*) *funebrana*, Fr., its bionomics and methods of fighting it.]—**«Туркестанское Сельское Хозяйство.»** [*Agriculture of Turkestan*,] *Tashkent*, Feb. 1914, pp. 133-13-.

In Turkestan, *C. funebrana* is as serious a pest of plums, as *Cydia* (*Carpocapsa*) *pomonella* is of apple trees, but the non-recognition of the *Cydia* pest by fruit-growers and the considerably smaller importance of plum-growing, have resulted in a total absence of any organised campaign against it. In cases when this moth has played havoc with the yield of plums, the owners usually leave the fruit on the trees, thus creating favourable conditions for the further multiplication of the insect. The author describes the imago and egg of *C. funebrana* and gives some information as to its life-history. The moths appear during April and May, flying mostly in the evenings (before sunset) round plum trees and ovipositing on the surface of the plums, one egg (rarely two) being laid on each fruit. The eggs hatch 5 to 6 days after oviposition, and the young larvae usually penetrate into the fruit from beneath, less frequently at the sides, and never on the top. Before gnawing through the skin, the larva makes a web over some part of the surface and in 30 to 40 minutes after emergence from the egg, it disappears into the fruit. The larvae remain inside the fruit not more than 30 days; pupation takes place on the surface of the earth and the pupal stage lasts about 10-12 days, after which a second brood of moths appears and oviposits on the fruit as before. The first generation injures the fruit mostly during the end of May and throughout June, while the second generation does so in July and August. The larvae of this generation pass the winter in their cocoons and pupate in the following spring. The author points out that the fruit damaged by the first generation shrivels and falls, while that damaged by the second generation does not shrivel, but ripens prematurely. *C. funebrana* attacks also sloes, peaches, and sometimes cherries. The variety of plums known as "kok-sultan" is less injured than others. Among remedies, the author mentions the digging of the earth underneath the trees in autumn or spring and the removal of all wormy fruits. He points out that it is more laborious to fight the insect when it has already begun to be active and when all stages of it would be present, the best time for attack being autumn or spring when the pest is in its pupal stage in the earth. Thus the digging is the more important remedy. The removal of the wormy fruits, which is recommended in case the first remedy has not been applied, must be repeated twice or even thrice during the season. The collected fruits must be immediately buried, as otherwise the caterpillars may emerge and pupate safely. The first generation is usually less numerous and causes less injury.

KOROLKOV (D. M.). **Вредныя для сада насѣкомыя и мѣры борьбы съ ними.** [Insects injurious to Orchards and methods of fighting them.]—**«Садъ и Огородъ»** [*Orchard and Market-Garden*], *Moscow*, Feb. 1914, pp. 69-74.

The author's object is to acquaint fruit-growers with the necessary preventive remedies which must be applied in spring against various pests of orchards. He deals first with *Anthonomus pomorum*, L.

giving a popular description of the pest, its life-history and the damage done by it. As remedies, which must be applied in spring, he suggests the cleansing of the trees from the loose bark, especially near the ground, where the weevils winter, and the destruction of the rubbish scraped off the trees, as well as of fallen leaves, etc. When the imagines appear in April, it is advisable to shake them from the trees on to sheets and burn them; a detailed description of the preparation of these sheets is given. [See also this *Review*, Ser. A, i, p. 235.] Spraying the trees with milk of lime is also suggested.

Psylla mali, Schmbg., and *Aporia crataegi*, L. are also dealt with. Against the former the author recommends spraying early in spring, on frostless days, with sulphate of iron, in order to destroy the eggs, and later, when the larvae have appeared, with tobacco extract or green soap, giving recipes for the preparation of these insecticides. As to *Aporia crataegi*, the destruction of the winter nests is recommended.

GERTOPAN (A.). **О возможности появленія совки на яровыхъ хлѣбахъ посѣва 1914 г. въ Екатеринославской губ.** [On the possibility of an outbreak of *Tapinostola (Oria) musculosa*, Hb., on the summer-sown crops of 1914 in the Govt. of Ekaterinoslav.] — **«Южное Хозяйство»** [*Southern Husbandry*], *Ekaterinoslav*, Feb. 1914, pp. 123-129.

Tapinostola musculosa last year destroyed summer-sown, as well as winter-sown, crops in several districts of the government of Ekaterinoslav; in May of that year, thousands of dessiatines (2·7 acres) of crops were completely lost. Many agriculturists have applied no remedies to prevent the reappearance of the pests this year, such as turning down the remains of the crops or the stubbles, and reploughing the fields immediately. It is therefore likely that a fresh outbreak will occur this year and the author suggests abandoning altogether the sowing of summer-sown crops (barley, wheat and oats) on fields damaged last year by this moth and sowing instead crops which are not attacked by it, such as peas, Turkish beans (fassol), lentils, vetches, maize, sorghum, potatoes, beetroots, bachza plants, sunflower and mustard. Rape and ravison cannot be recommended as they are attacked by many other pests.

GOUGH (L. H.) & STOREY (G.). **Methods for the Destruction of the Pink Boll Worm in Cotton Seed. Appendix.**—*Agric. Jl. of Egypt, Cairo*, iii (1913), no. 2, 1914, pp. 93-95, 1 fig.

The following information is embodied in an appendix to a paper abstracted on pp. 218–219 of the current volume of this *Review* and deals with a method consisting of placing cotton seed on a metal tray, to which electrical sparks were passed from a metal brush held about 5 inches above it. Eight experiments were made, the results of five being tabulated. In no case was there any abnormal mortality amongst the caterpillars and germination was unaltered or only slightly reduced, except with an almost sparkless discharge which appeared to have had a slightly beneficial effect on the seed. A spark-gap of about $4\frac{1}{2}$ inches only, was used throughout, but the results did not

justify hopes that an extra 1½ inch in the spark-gap would be more satisfactory. The three remaining experiments were as follows: (1) A few larvae were picked out and subjected to a shower of sparks about 4 inches in length; (2) a number of "double" seeds were treated in the same way; (3) a sheet of white paper was laid on the metal plate and the positions of 20 seeds marked on it as carefully as possible; a shower of sparks was then passed between the brush and the plate. The results of these three experiments support those of the former five. Every larva that was struck by a spark in Experiment No. 1 was killed by it, the spark piercing its skin and causing bleeding; but on the other hand, not a single larva killed by a spark could be found in the seeds from Experiment No. 2. A diagram showing the position of the seeds and of the holes pierced by sparks in Experiment No. 3 is given and demonstrates that only in one instance, that of a "double" seed, had a spark traversed any of the spaces marked out as being covered by the seeds. This shows fairly conclusively that it is quite impossible to "make sure that a spark passes through each seed," as was suggested, without an excessive waste of time and electric current.

STOREY (G.). **Seasonal variation in the Common Boll Worm** (*Earias insulana, Boisd.*)—*Agric. Jl. of Egypt, Cairo*, iii (1913), no. 2, 1914, pp. 99–102, 1 pl., 1 chart.

The variability of the adult boll worm is shown by the fact that it has been described as no less than nine distinct species, as follows: *insulana*, Boisd.; *smaragdinana*, Z.; *siliquana*, H.-S.; *frondosana*, Walk.; *xanthophila*, Walk.; *simillima*, Walk.; *chlorion*, Rmb.; *gossypii*, Frauenf.; *tristigosa*, Butl. Sixteen specimens which illustrate the natural variation of the species are depicted in a coloured plate, two being close approximations to the type form *insulana*. In addition to these, three other forms which occur in Egypt have received varietal names: ab. *anthophilana*, Snell., ab. *ochreimargo*, Warren, and ab. *semifascia*, Warren. These names may be used in a loose sense for the sake of convenience. Dr. Gough's observations led him to believe that the variation was very largely due to climatic and seasonal conditions and at his suggestion the author arranged the very long series of moths in the Ministry's collection according to the dates on which they emerged from the pupa or were captured. The seasonal nature of the variation at once became apparent. The pure green type is the normal summer form; while during the winter the predominant form is ab. *anthophilana*, which is of a uniform yellowish tint—sometimes orange—except for some narrow dark lines across the wing.

GOUGH (L. H.). **Entomological Notes.**—*Agric. Jl. of Egypt, Cairo*, iii (1913), no. 2, 1914, pp. 103-106, 1 pl.

A parasite of the Pink Boll Worm, *Pimpla roborator*, Fabr., is fairly common near Cairo, and, accepting the theory that *Gelechia gossypiella*, Saund., is a recent introduction into Egypt, it must be supposed that this *Pimpla* has recently taken to preying on *Gelechia* larvae. The larvae are known to feed externally on a great variety

of other insect larvae. They superficially resemble fly-maggots and are found in seeds hollowed out by the Pink Boll Worms. The adult insects are very common just after the cotton picking in the sheds where unginned cotton is stored, and may be found flying over the cotton and crawling amongst the lint. Nearly all through the year they may be taken flying over the large thistles common on the margins of the desert near Me'adi, and do not appear very particular in their choice of a victim, provided it is a boring insect. It is possible that more than one host larva is destroyed and although not yet definitely observed feeding on *Earias* larvae (Common Boll Worms) they probably do so.

A New Cotton Insect. ***Cryptoblabes gnidiella***, Mill., a small Pyralid moth, has been bred from cotton bolls collected at Belqâs and Desûq in November 1912 and at Damanhûr in December 1913. This very widely distributed species also occurs in Europe, and seems to be a general feeder. It has also been reared from pomegranates from Gizâ in July 1912. As yet it has caused no appreciable damage to the cotton crop.

The Kharga Oasis Date Worm. The quality of the dates yielded by the 400,000 palms in the Kharga Oasis is infinitely inferior to the fruit exported from the neighbouring Oasis of Dakhla. This is due to a great extent to the ravages of the larva of a Pyralid moth, ***Ephestia cautella***, Walk., which feeds on the dates when half-ripe. The inhabitants of the Oasis are said to pick their dates half-ripe and roast them in order to kill the larvae. The larvae leave the dates to pupate, spinning a very loose cocoon, consisting only of a few threads. The author found them in 1912 pupating in the date store of the Western Oasis Company, behind loose plaster and in cracks of the wall. This species is often parasitised by *Rhogas kitcheneri*, Dudgeon and Gough, and also occurs in the Delta, where, however, it does not appear to do much damage. It has been found feeding on pomegranates and has been bred from pears imported from Beyrût.

The Pomegranate Butterfly. Although the pomegranate butterfly, *Virachola (Deudorix) livia*, Klug, is well known to cultivators of pomegranates from the damage its larvae does to their fruit, the mature insect does not appear to be often observed by them. The eggs are laid on the fruit soon after they have set; the young larvae penetrate into the pomegranates and feed there. A "sooty mould" often follows these ravages. The larvae leave the fruit to pupate. The butterflies are on the wing in April-May, July-August, and in December-January. In Egypt the caterpillars feed on pomegranates, dates, and sunt pods (*Acacia arabica*), and at Aden on pods of *Acacia edgworthi*. The best method of preventing damage is by "bagging" the fruit as soon as it sets, *i.e.* in March or April. Transparent paper, coarse muslin, or palm-leaf bags do very well for the purpose. In addition, all damaged fruit should be collected and buried at least two feet deep.

DUDGEON (G. C.) & GOUGH (L. H.). **Description of two Braconids parasitic on *Earias*.**—*Agric. Jl. of Egypt, Cairo*, iii, (1913), no. 2, 1914, pp. 108-110, 2 pls.

The two new species described are *Rhogas kitcheneri* and *R. lefroyi*. *R. kitcheneri* is parasitic on the Egyptian boll worm as well as on

the date worm and is widely distributed in Egypt. There is no doubt that it might be as effective in the control of Egyptian insects as *R. lefroyi* has proved to be in India, and, of course, requires no acclimatisation. This insect deposits its eggs in the larvae of the host, whence its larvae emerge, pupating outside in small, ovoid, silken cocoons, generally found associated with the dead larva of the host. *Rhogas lefroyi* has been frequently mentioned in reports on *Earias*, both in India and Egypt, but has never been described. Specimens introduced into Egypt were not successfully established and the discovery of *R. kitcheneri* now renders its acclimatisation unnecessary.

MELANDER (A. L.). **Winter Sprays: Sulphur-lime Wash and Crude Oil Emulsions.**—*Washington Agric. Expt. Sta., Pullman, Popular Bull. no.* 64, Feb. 1914, 8 pp.

What is known as the 1 : ½ : ½ formula for sulphur-lime contains Sulphur (flowers, or ground sulphur) 1 lb., good stone lime ½ lb., water ½ gallon. This may easily be remembered and adapted to any size of cooking vessel. This should read about 28° Beaumé, corresponding with 1·2357 specific gravity. Experiments have shown that a solution containing 1 lb. sulphur and ½ lb. lime to 5 gals. of water is sufficiently strong for spraying dormant orchards. Such a solution has a specific gravity of 1·02. Sulphur-lime of any strength may be reduced to the 1 : ½ : ½ formula by the following calculation :—the decimal of the specific gravity of the concentrate, divided by the decimal of the dilute, gives the number of volumes of diluted spray obtainable from one volume of the concentrate. For instance, ·2357, the decimal corresponding to 1 : ½ : ½ sulphur-lime, divided by ·02, the decimal of 1 : ½ : 5, gives approximately eleven. One volume of the 1 : ½ : ½ strength will therefore dilute to eleven volumes of ready-to-use solution. If a factory-made sulphur-lime, testing, say, 34° Beaumé, or 1·3015 specific gravity, is used, its decimal ·3015, divided by ·02 would indicate fifteen volumes of spray solution. The hydrometer is thus a valuable instrument to the fruit-grower. The temperature of the liquid to be tested should be about 65° F. Crude oil emulsions are coming into favour, one point being the greater ease with which an oil spray spreads and penetrates, thus insuring a more thorough application than with the watery solution of sulphur-lime. The author gives the following formula : Soda 3 lb., hot water 10 gals., fish-oil soap 20 lb. (these form the emulsifier), crude oil 20 gals., and water to make up 200 gals. The soda should be dissolved first in the hot water followed by the fish-oil soap. This emulsifier is then added to the spray tank containing 167 gals. of water, and the agitator is run at full speed. The oil is then slowly poured in while the agitator churns the mixture into a coffee-and-milk-coloured liquid which contains 10 per cent. of crude oil. After the emulsion is made, nothing else, not even water, should be added, or the oil might separate. This California formula is based on a 200-gallon tank equipped with screw-propeller agitator and gasoline engine pump. In applying winter sprays it is important to cover every side of every branch. While most pests occur on the surface some few individuals hide behind the buds, in the cracks of the bark or at the tips of the branches. These neglected individuals are the ones that tide the species over the winter and make spraying again necessary in the following year.

TRABUT (—). **A Propos des Plantations de Vignes françaises dans le Departement d'Alger Phylloxéré.** (On the Plantations of French Vines in the Department of Algiers infested with Phylloxera.)—*Bull. Agric. Algér. Tun. Maroc., Algiers*, xx, no. 3, Feb. 1914, p. 92.

M. Bertrand states that there is great danger in urging the vine-growers to plant French vines at this time, in the hope of being able to protect them from the attacks of *Phylloxera* by means of insecticides. None of the treatments of winter-eggs will prevent the young vine plants, which have been so imprudently planted, from being attacked by this pest.

RUTHERFORD (A.). *Xyleborus compactus*, **Eichh., a Borer of Tea and Coffee.**—*Trop. Agric., Peradenyia*, xlii, no. 2, Feb. 1914, pp. 131-132.

In October 1913, the Entomologist received from Wattegama, specimens of tea plants from the nursery said to be attacked by shot-hole borer. Of these plants 50 per cent. were damaged, the point of attack being below the ground-level. The insect, though resembling *Xyleborus fornicatus*, Eichh., was at once seen to be a different species, and the beetles in each tunnel are much more numerous than in the case of *X. fornicatus*. It appears to be identical with specimens of a Scolytid received in September 1911 from Pelmadulla, where they had been attacking *Coffea robusta*, which Green regarded as almost certainly *X. coffeae*, remarking that this pest had not previously been recorded from Ceylon. It has been identified by Col. Winn Sampson as *X. compactus*, Eichh.

NORRIS (F. de la Mare). **Locust Work in December.** *Agric. Bull. Fed. Malay States, Kuala Lumpur*, ii, no. 7, Feb. 1914, p. 186.

The catch of locusts in Selangor for December was 1,500 tins, representing 400 swarms; experiments have been carried out giving very favourable results, and it is hoped in dealing with the next generation to supplant the bag-trap system to some extent by the use of poisons. Flying swarms in various parts of the State have been kept under observation.

SPRINGS (F. G.). **Notes on Indigo Planting in Malaya.**—*Agric. Bull. Fed. Malay States, Kuala Lumpur*, ii, no. 7, Feb. 1914, pp. 187-188.

Attempts which have been made recently to cultivate indigo as a subsidiary crop amongst young coconuts and rubber at Kuala Lumpur, have shown that it is unlikely that this plant will do well, owing to the appearance of an insect pest. This is the larva of a moth (not as yet identified) which eats the leaves and young shoots. It is probable that if the cultivated area extends the pest will become more prevalent. In consequence, it is not deemed advisable for the present to extend the cultivation of indigo in Malaya.

Froggatt (W. W.). A descriptive Catalogue of the Scale Insects (*Coccidae*) of Australia.—*Agric. Gaz. N.S.W., Sydney*, **xxv**, pt. 2, Feb. 1914, pp. 127-136, 1 pl.

The first part of a catalogue of Australian Coccidae is given, in which the species are described, with their mode of occurrence and distribution. In the present part, 14 species of the genus *Aspidiotus* are dealt with, of which three are new, namely *A. alatus*, occurring on the twigs and leaves of Eucalyptus at Dubbo and Wagga, N.S.W.; *A. confusus*, on the trunk and branches of a white gum (*Eucalyptus* sp.) at Narara; and *A. coralinus*, on the young foliage and branchlets of a scrub tree (*Eremophila sturtii*) near Bourke, N.S.W.

Cacao Beetles and Thrips.—*Bull. Trinidad and Tobago. Dept. Agric. Port-of-Spain*, xiii, no. 78, Feb. 1914, pp. 43-44.

F. W. Urich is reported to have stated (January 1914) that he had not met with any particularly severe attacks, but on many estates, beetles (*Stirastoma depressum*) and larvae were being caught in large numbers and the moment was opportune for spraying trees, especially those from three to five years old. The beetles are very active during the dry months and spraying should be done immediately. Urich recommends that posters be printed calling attention to the beetles and the methods of control, which should be put in conspicuous places in the badly affected districts. Thrips (*Heliothrips subrocinctus*) were on the increase. To prevent damage to the June crop, spraying is required before the new growth of leaves begins. At Sangre Grande some fields affected by thrips in 1911 and 1912 which were forked and limed in the latter part of 1912 were not seriously infested up to the present.

McKillop (A. T.). On the conversion of cotton sticks into charcoal for the destruction of the Pink Boll Worm.—*Agric. Jl. of Egypt, Cairo*, iii, (1913), no. 2, 1914, pp. 127-129.

The pink boll worms, *Gelechia gossypiella*, are now present literally in millions, in the dry cotton bolls stored on the tops of the *fellahin* houses. According to A. Andrés, the larvae form cocoons in the interior of the seeds and remain in a dormant state for as long as seven months, without requiring any nutriment. The storing of cotton sticks containing dried and diseased bolls, which afford protection to the moth and larva, allows the generation to be carried on from one season to another. It might be advisable to introduce into the ordinance now under reconstruction, a proviso that all cotton sticks be destroyed by fire or carbonized before a fixed date. It is obviously of importance to retain as much fuel as possible and the carbonization of the wood suggests a compromise of economic value. The inconvenience that cultivators will be put to is not a sufficient reason for refusing to carry out what will not only be a means of destroying and preventing the reproduction of the pink boll worm, but also of reducing the numbers of the common boll worm (*Earias insulana*). It is recommended that all cotton sticks be converted into charcoal before removal from the fields. A table is given of 11 results obtained by the *baladi* method in 7 districts. The return

of charcoal varied from 9 per cent. in one instance to 55 per cent. in another. The average return of charcoal was just under 34 per cent. It is thought that in the highest percentages (one of 55 and three of 48) the charcoal must have been damp when weighed and a large amount of dust included. The *baladi* method is as follows: The cotton sticks are closely packed into a pit about 20 inches deep by 16′ 8″ long and 6′ 8″ wide at one end and 3′ 4″ at the other, and heaped up to a height of about 4′ 2″ above ground-level; a layer of straw refuse, several inches deep, is spread over the surface, leaving a portion of the narrow end uncovered, which, for choice, should be the end from which the prevailing wind blows. Three or four ventilation holes are opened at the sides and the wide end, to regulate the draught. The sticks at the exposed end are there lighted, and when the fire has got a good hold the end is closed with straw refuse or some other damping material. During the process of burning, which may last from 24 hours to 3 days, water must be frequently applied to prevent the kiln from bursting into flame. Messrs. Kingsford and Crewe have patented a retort which will convert small lots of cotton sticks into charcoal in a few hours, and is capable of making from one-quarter to half a ton per day. It can be seen working at Gezira. The calorific value of the charcoal is 7·420 as compared with that of cotton wood, 2·744. Ordinary charcoal is retailed in Cairo at £(E)8 to £(E)12 per ton. The cotton stick charcoal was readily bought at £(E)4 per ton and this price more than covers the expense of burning. In enacting complete legislation against the pink boll worm, it will be necessary to provide for its destruction in the field, as well as in the seed, at the time of ginning.

GROHMANN (—). **Die Generation des grossen braunen Rüsselkäfers** (*Hylobius abietis*) **und seine Bekämpfung.** [The large brown weevil (*Hylobius abietis*), its reproduction and control.]—*Tharandter Forstliches Jahrbuch, Berlin*, lxiv, no. 4, 1913, pp. 325-361, 3 figs.

The available knowledge concerning the reproduction of the pine weevil, (*Hylobius abietis*) and control measures against it, is very insufficient. Since 1909, the author has made a study of its life-history, which has been facilitated by a system of trapping devised by him primarily for the destruction of the pest. The trap is made by digging a hole measuring about 2 feet each way. If the soil removed is not sandy or loose, it must be reduced to a uniform fineness, free from large roots or stones. Eight to twelve posts of fir, with one end sharpened to a point, are driven into the hole at regular distances until their tops are only about 8 inches above the edge. They should be about 3 to 4 inches thick at the top and their length (excluding the sharpened point) about 32 inches. The fine soil is then put back till the hole is filled level with the ground. Fir branches about 3 to 5 feet long are then laid flat on the ground between the posts with their tips outwards and their stems inwards. Ordinary soil, freed from very large roots and stones, is then strewn over a surface extending from the centre to about a foot beyond the posts and packed in round the branches and the posts. A stratum of soil about 2 inches deep is then spread over the branches and on this another layer of branches is laid as before. This process is repeated until the posts are buried some

6 inches deep. In this manner a small mound is erected with edges fringed with green twigs. Instead of fir, pine may be used for the posts and branches, but the former is much to be preferred. The author states that these traps attract the beetles, which remain there during mating and oviposition, so that specially threatened plantations may thus be saved. They also afford a refuge and breeding place for many reptiles and insects which prey upon *Hylobius* in all its stages.

On being fecundated, the female goes into the heap in order to lay her eggs under the bark, in the cambium of the branches and posts, preferring places where the bark has been damaged and pieces of it have been removed. The eggs are laid singly in May, and oviposition continues through the summer and even until the end of September. Most of the eggs are laid in June, July and August. The author states that after reproduction, all the adults emerge from the traps and die in the open. This view is based on the fact that living individuals were only found in the traps from May to October and principally from June to August, whilst none have been found hibernating in numbers anywhere in the German forests. The author believes that the few which have been found are late autumn broods which have not had an opportunity of breeding.

On beginning to feed, the larvae first make galleries under the bark, in the cambium and also in the young woody fibres and later penetrate into the sap-wood. Their growth is complete after the third month and their size then varies from $\frac{4}{5}$ to 1 inch. In the traps the larvae developed in the thick portions of the branches as well as in the posts. The pupal stage lasts about a fortnight, and the whole normal development occupies about 15 months. This time may be varied by circumstances to anything between 13 and 22 months. The author states that the beetles which appeared in clearings or young plantations in April, May and June, 1913, were hatched from eggs laid from July to September, 1911. The beetles appearing in July, August and September, 1913, hatched from eggs laid from May to July, 1912. Beetles completing a long reproductive cycle appear in the spring, and beetles starting a long reproductive cycle appear in the summer.

Besides *Hylobius abietis* the traps were also used by *H. pinastri*, *Pissodes notatus*, *Hylesinus piniperda* and *H. cunicularis*. Other inmates were: slow-worms (*Anguis fragilis*, L.), various lizards, Hemiptera, spiders, ants, centipedes, millipedes, Staphylinids, Elaterids, ground-beetles, and Braconids. The larvae of the Elaterids and of the ground-beetles seemed the most active destroyers of *Hylobius* larvae. Of the ground-beetles those most frequently met with in the traps were: *Pterostichus oblongopunctatus*, *Abax striola*, *Carabus auratus*, *C. cancellatus*, *C. granulatus*, and *C. violaceus*. The Braconid eggs were laid in the *Hylobius* larvae; the author also found numerous white, very thin wire worms $\frac{1}{5}$ inch long, which he believes feed on *Hylobius* larvae. It is further certain that the beetle has many other enemies besides those mentioned here.

This beetle is able to scent freshly cut timber at considerable distances, and clearings become centres for further infestation. So far, all control methods have failed and at present the pest is allowed to levy a heavy toll quite unchecked. A record is given of the various measures hitherto tried. The author is positive that the traps described

here, provide a sure means of combating *Hylobius abietis.* They have been subjected to tests extending over a number of years and have given excellent results, both in the mountains and in the lowlands. In the numerous trap inspections personally carried out by the author, large numbers of natural enemies were found. An important point is that depressions in the ground must never be used as sites for traps. Wherever possible the latter should be placed on high ground. They should be constructed as directed, but exaggerated accuracy is not necessary. According to the distance from which the branches were brought, the cost of each trap ranged from about 9d. to 15d., the value of the wood not being included. The cost per acre varies according to the control desired, as set forth below. Traps should at once be constructed where (1) it is desired to protect the edges of a plantation; (2) the areas infested by the beetle are required for planting, (3) beetles are unusually numerous on any particular spot. Edge protection is nearly always necessary on the sides of a clearing, especially where it borders on young plantations, and it should also be carried out where young plantations border on old ones in which much timber has been felled. In cases where the timber has been cut down in summer, the traps must be constructed immediately. Where clearing has been done in winter, they should be prepared about the middle of April. In any case they must be ready by the time the beetle begins to feed. At first the traps may be placed at intervals of about 60 yards. As it is important that freshly baited traps be constantly present, new ones may be constructed along the same line later on at distances of 20 yards. For instance, a line of traps 60 yards distant one from another is constructed by the middle of April, and added to at the beginning of June and again about the middle of July. Thus, if the line has 10 traps at the start there will be 30 at the end of the campaign. Early in spring the traps must be dug up and the soil spread evenly around the hole. The posts and branches, with the beetle brood contained in them, are burned. There need be no fear that any natural enemies will be sacrificed, as but very few will still be present. If this system of protection is required to be renewed a second or third year, the old holes may be used to save expense. Where clearings left untouched during one summer are to be replanted, they should be studded with traps if beetles are present. Only a few traps are required for this purpose, one being sufficient for every 2,500 square yards approximately. These traps should be established immediately the replanting is effected and will chiefly serve to catch fresh arrivals. To deal with the beetles native to the spot, well-baited traps must always be present. To ensure this, two new traps should be constructed near the old ones at fortnightly intervals starting from about the middle of July. Thus a clearing which has lain untouched for a year will contain four traps to every 2½ acres in spring and this number will increase to 12 traps by the end of the year. In the following spring the traps must be cleaned out and the posts and branches burned. Four of the traps must then be re-constructed, and they will serve to catch the beetles resulting from eggs laid late in summer two years before. It is well to duplicate each of these four traps in July or August to catch beetles appearing in those months from eggs laid when the replanting was in progress. This second year's batch of eight traps must be cleared as usual in the following spring and control

may be considered as accomplished. Should further injury be noticed, it is due to beetles from neighbouring timber, and therefore it is advisable to continue the edge-protection mentioned above for some time longer. Where beetles are to be combated on clearings which have been untouched for two years, the same method is used as for protecting a plantation in the second year of its growth. For instance, after such plantation has had edge-protection during the spring and summer of 1912 and 1913, it must be provided with four traps per $2\frac{1}{2}$ acres to start with and one or two extra traps must then be added in July or August. In this case, control may be considered complete when the traps are cleaned in the following spring. A great advantage of delaying replanting until two summers have passed is that such replanting escapes the period when the beetles are most abundant. Where replanting is carried out after one summer only, great care is necessary for the properly-timed construction of the supplementary traps, or damage will be done to the young trees.

Where the aim is to destroy *Hylobius abietis* without any thought of protecting plantations, the best time for setting the traps is when the pest is most abundant. If clearing is effected in winter, then the following months of July and August are best suited. If effected, say, in August 1914, then the favourable time would be in April 1915. The time at which this system of trapping should begin is strictly regulated by the data given above as to the life-cycle of the weevil. The system is simpler than it appears at first sight and the author publishes it with the conviction that many a pine and fir plantation will be saved by means of it.

NEGRI (U.). **Il Rinchite del Mandorlo.** [The almond *Rhynchites*.] —*Boll. Catt. Amb. d'Agric., Brindisi*, viii, no. 2, Feb. 1914, pp. 12-13.

The author has observed the first two generations of the *Rhynchites* which infests the almond, a tree of great economic importance in Puglia (where the pest is called *campa* or *campio*) and in Sicily. About the end of February or the beginning of March, the females pierce the buds and deposit in each, one egg from which a yellow-red larva emerges. This feeds in the bud, working in a circle and covering the pistils with a silky froth which prevents the bud from opening. The larva completes its cycle within the flower during the period of pollination, which varies from 15 to 20 days. It appears as a perfect insect just about the time that the fruit acquires its shell and pierces the tiny fruit with its proboscis in order to deposit the eggs for the second generation. This injury causes the fruit to fall and where infestation is severe the crop is lost from that moment. The author has observed that when two larvae meet the stronger devours the weaker.

FUCHS (—). **Ueberblick über die forstliche Entomologie.** [A brief survey of Forest Entomology.]—*Entom. Zeitschr., Frankfurt a. M.*, xxvii: nos. 24-26, 28-30, 32-36, 39-42, 44-45; 13th Sept. 1913–7th Feb. 1914.

The author deals with all the forest insects of Germany, giving a full account of those of economic importance and a cursory notice of others. The subject matter is arranged on a systematic basis, in order

to avoid the repetition entailed by the handling of the subject according to timbers. The text contains numerous figures illustrating the insects and the injuries they cause.

P. F. **Die Organisation der Wurmbekämpfung mit Nikotin.** [The organisation of vine moth control with nicotin.]—*Luxemburger Weinztg, Grevenmacher*, ii, no. 3, 1st Feb. 1914, pp. 37-40.

Control of vine pests, particularly that of the vine moth, demands the united action of all vine-growers in order that the cost of material may be reduced and success ensured by speedy application. The flight of the moths only lasts from 8 to 10 days and it is necessary to use all available means in that period. A system of co-operation would be a great help. If spraying with nicotin were carried out in every vineyard, one application would probably suffice per year, but where control is not universal, two applications are required.

ZSCHOKKE (A.). **Massnahmen zur Hebung des Weinbaus.** [Measures for the improvement of viticulture.]—*Weinbau der Rheinpfalz, Neustadt a. Hdt.*, ii, no. 3, 1st Feb. 1914, pp. 26-32.

The area devoted to viticulture in Germany is shrinking, and furthermore the site value of vineyards is now only $\frac{2}{3}$ or $\frac{1}{2}$ that of about 20 years ago. One of the three reasons given by the author is the more difficult and more costly working of vineyards. It is necessary to plant vineyards in such a fashion that pest control may be rendered easy and attainable with the smallest possible outlay of time and labour. One necessary reform is the abolition of cross-baulks. Wherever possible, wood must be replaced by stone, iron, and iron wire. Planting in rows will permit the plough to be used for turning up the soil. The fastening of the summer-shoots with straw is obviated by passing them between two wires. Spraying associations will cheapen, simplify and speed up the application of insecticides. Co-operative buying will effect saving in purchasing material. Lastly, the small grower will save by abstaining from experimenting with all kinds of secret preparations.

SHCHEGOLEV (I. M.). **Вредныя насѣкомыя и болѣзни растеній, наблюдавшіяся въ Таврической губерніи въ теченіе 1913 года.** [The injurious insects and diseases of plants noticed in the Govt. of Taurida during 1913.] **« Отчетъ о дѣятельности помощника Губернскаго Энтомолога Таврическаго Земства за 1913 годъ.»** [*Report of the Assistant-Entomologist of the Zemstvo of the Govt. of Taurida for* 1913.] *Simferopol*, 1914, 24 pp.

The author begins his report with the remark that the last year can be called a "year of *Lymantria dispar*," as this was the principal pest, appearing over an area of some 54,000 acres and threatening to play havoc with forests and orchards. It was evident in the preceding autumn that an outbreak might occur, indicated by the large amount of eggs deposited; an examination of the forests confirmed these fears. The author mentions the precautions taken by the Station in order to acquaint the population with the threatened danger and with the remedies which ought to be immediately applied. Certain orchards,

though situated in the most threatening surroundings, near forests and mountains from which the caterpillars were constantly brought by the wind, had full leafage, as their owners conducted the fight against the pests energetically ; while, where no remedies were applied, the trees were quite leafless and gave no harvest. At first when the caterpillars were small and were being transported by wind, constant care was necessary, the measures adopted being, spraying with Paris green or with the latter mixed with Bordeaux liquid, and shaking the caterpillars from the trees. Owing to the small doses of poison applied there was some delay before the caterpillars were destroyed : some owners tried tobacco dust, but without beneficial results and had to return to the above-named insecticides. The author thinks it a matter of regret that nowhere has Djipsin been tried, as this is a stronger poison than Paris green and causes no injury to the leaves. When the movement of the caterpillar ceases, the principal remedy consisted in bait-belts, which proved very valuable, although most owners had no sticky material of a good quality. [See this *Review*, Ser. A, ii, p. 271

The author proceeds to deal with the following pests :—*Psylla pyri*, L., has not done much damage, although an outbreak was expected in view of the great amount of eggs. It is assumed that the cold winds prevailing during the hatching time of the larvae had a prejudicial effect.

Hoplocampa brevis, Klug, has injured a great number of ovaries of pear trees in some localities in Alushta ; beyond shaking down from the trees, no remedies were applied, although spraying of the unfolded buds with milk of lime or carbol-emulsion might have prevented much harm.

Anthonomus pomorum, L., multiplied in great numbers and has done serious damage to ovaries of apple and pear trees in many parts of the country. Very often the owners mistake the damage done by this pest for that caused by frosts and take no measures against it ; shaking down from the trees and belts early in spring are suggested. The damage actually done was to some extent diminished owing to the early blossoming of the trees and to the late appearance of the weevils, which occurred in many places after the fruit was set. *Rhynchites pauxillus*, Germ., appeared as usual, and *R. bacchus*, L., did noticeable damage to apple trees in some localities.

Cydia (*Carpocapsa*) *pomonella*, L., appeared in great numbers ; in some orchards, as many as 150 caterpillars were found underneath one belt. A large number of caterpillars hibernated, special attention should therefore be paid to the bark of the trees.

Aphis on apple and pear trees appeared nearly everywhere. The fight against these lice in the Crimea is made more difficult owing to their appearance at the time when the trees are first sprayed with Bordeaux liquid and Paris green, which fungicides do not affect the pests and at the same time make it troublesome to repeat the sprayings with other insecticides ; when this is done later, the lice have already curled the leaves and thus formed some sort of protection for themselves against the poison.

Eriocampa adumbrata, Klug, caused great devastation in the lower parts of the river Katcha ; the larvae attacked mostly cherry trees, but also apple, pear and nut trees ; it was impossible to apply remedies, as the time of the outbreak coincided with the cherry harvest. The

author remarks that such an outbreak has not occurred for many years.

Luperus rufipes, Scop., was observed in noticeable numbers on some apple trees, as well as on alder trees, in the valley of the river Alma. *Galeruca crataegi*, Bach. (*xanthomelaena*, Schr.) appeared in some parts round Simferopol on elms. Some species of *Lecanium* probably *L. corni*, Bouché, were found in large numbers on apple trees in one locality, where they have never previously appeared. It is assumed that the pest migrated from the forests to the gardens. *Lyonetia clerkella* appeared in extraordinarily large numbers, being absent only in a few fruit gardens and on scattered apple trees. This outbreak has not resulted in serious damage, only the trees attacked early in the season having suffered seriously.

Choreutis parialis, T., also appeared in enormous numbers in the orchards along the river Katcha. The following remedies are suggested: spraying with Paris green or with Bordeaux mixture and Paris green, and applying belts so as to prevent the caterpillars which have been thrown from the trees by the spraying from getting back; the spraying must be done at the end of June, before the caterpillars have got underneath the ends of the leaves. *Hyponomeuta malinellus*, *L.*, did not do serious damage, although appearing in large numbers. It was noticed that the increase in the caterpillars was quite suddenly arrested. This is explained by the great multiplication of their parasites, which succeeded in stopping their spread.

The first generation of *Phlyctaenodes sticticalis* seriously damaged market-gardens, orchards and grasses, and the moths of the second generation hatched out in enormous quantities, but perished without depositing. The aphis, *Brachycolus noxius*, Mordw., did noticeable damage to winter-sown crops in the district of Eupatoria, although their numbers were much less than last year.

Борьба съ вредными насѣкомыми въ лѣсничествахъ Тамбовской губерніи въ 1913 году. [The fight against injurious insects in the Forests of the Government of Tambov in 1913.] – **«Лѣсная Жизнь и Хозяйство.»** [*Forest Life and Economy.*] *Tambov*, no. 6, March 1914, pp. 15-18.

Injurious insects in the forests of the government required less attention in 1913, owing chiefly to the fact that it was not a cockchafer year. In the three forest areas in which organised collections of *Melolontha melolontha* took place, only 1,314 lb. were obtained as compared with over 26½ tons in the previous year. In the forests of Andreev and Fastchevsk, tobacco dust was either scattered over the ground or dug into the soil. The efficacy of this method is still in doubt as there has not yet been time to test it properly.

In the pine plantations of the forest of Gorielsk, an undetermined insect which attacks the young shoots did considerable damage in 1912; in 1913 the collection of these insects were undertaken. Their presence in the trees could be ascertained by thick swellings on the attacked shoots, marking the place of entry and smeared with a resinous exudation, most of the attacked pines being covered with web. In order to extract the pest from the shoots, the latter were carefully tapped with sticks. During May and June some 197,000

insects were collected in this way on an area of 305 acres; the [illegible] from which the insects were extracted recovered and it is sugge[illegible] that this method should be applied again in 1914. *Eupr*[illegible] *chrysorrhoea* appeared in the forest of Borisoglebsk, where its [illegible] were collected from oak trees over an area of 453 acres.

In the district of Pri-Usman, in forests consisting chiefly of [illegible] and oak, with a mixture of aspen, operations against *Retinia* [illegible] undertaken, consisting of cutting off and burying the branches [illegible] which the larvae had begun their attacks; and it is thought that [illegible] 1914 the damage by these insects will be less.

Lophyrus pini appeared in the forest of Bokin and *Hylobius* [illegible] in that of Pushtin. In the forests of Romanov and of Jarov, *Lop*[illegible] *derium pinastri* was noticed in nurseries and the seedlings were [illegible] sprayed with Bordeaux mixture, after which they recovered in [illegible] area. About 15 per cent. of the seedlings perished from this pest.

UVAROV (B.). **Задачи и программы дѣятельности энтомологических[illegible] учрежденій.** [The objects and programmes of the local ento[illegible] logical institutions.] — **«Земледѣльческая Газета.»** [*The A*[illegible] *cultural Gazette*], *St. Petersburg*, nos. 3 & 4, 1914, pp. 74-7[illegible] 114-115.

The question as to the best types of local entomological institu[illegible] was raised at the First Russian Conference on Applied Entomo[illegible] in Kiev in August of last year, and although the time at the disp[illegible] of the Conference did not allow of a thorough discussion of the probl[illegible] the idea which met with general approval was that it is necessary [illegible] distinguish clearly between the objects of Entomological Sta[illegible] or Branches of Agricultural Experimental Stations and of Ento[illegible] logical Bureaus. The author points out that Entomological Stat[illegible] must be chiefly concerned with the study of insect pests under nat[illegible] as well as experimental, conditions; this can be best arrived at [illegible] the Entomological Stations are connected with, and form a bran[illegible] the General Agricultural Experimental Stations. The work [illegible] Entomological Bureaus should be confined to acquainting the [illegible] with the results of scientific studies and giving practical assista[illegible] them in fighting various injurious insects. Their objects should in[illegible] the popularisation of entomological knowledge by means of po[illegible] pamphlets, lectures and of object lessons and experiments; [illegible] publication of local popular literature of a periodical character [illegible] the giving of advice as to the necessary current work in field [illegible] garden at each season.

The author further urges that the Bureaus should undertake [illegible] organisation of measures against pests, for which purpose [illegible] funds ought to be placed at their disposal; he does not go into [illegible] question of how these funds are to be raised, as the answer to this [illegible] vary in different localities. These Bureaus should, he thinks, [illegible] more numerous than the first-named type of Stations, and their [illegible] will be of considerable help to the latter in accumulating exper[illegible] and practical data.

MOKRZECKI (S. A.). **Вредныя насѣкомыя и болѣзни растеній, наблюдавшіяся въ Таврической губерніи въ теченіе 1913 года.** [The injurious insects and diseases of plants noticed in the Govt. of Taurida during 1913.]—« **Отчетъ о дѣятельности Губернскаго Энтомолога Таврическаго Земства за 1913 годъ.** [*Report of the Chief Entomologist to the Zemstvo of the Govt. of Taurida for* 1913], *Simferopol*, xxi, 1914, 13 pp.

The author deals only with certain points of importance regarding ... insect pests noticed during the year under report, more detailed ...rmation being contained in the report of his assistant. He deals ...st with *Brachycolus noxius*, Mordw., which did enormous damage ... 1912, decreasing the harvest in the area infested by 75 per cent. ...e author suggested ploughing the soil carefully for winter-sown ...ops and sowing them as late in the season as possible; in all places ...ere these remedies were acted upon, the state of the crops in the ...ring of 1913 was very good. However in April 1913, the aphids ...peared on trap crops of winter-sown wheat, which, in the form of a ... wide strip, surrounded a field of 918 acres; these trap strips were ...wn early, at the end of the preceding summer, as a protection against *Mayetiola (Cecidomyia) destructor* and owing to their specific purpose ...ld not have been reploughed; the sowing on the field inside this ...rip was carried out later. The author found that colonies of lice ...isted only on the trap strips, while the crops on the field were free ...m them; he recommended mowing the trap crops and re-ploughing ...e land, and after this had been done no more lice were noticed. Some time later colonies of lice appeared also on some other plots of a ...tal area of 378 acres, which had to be reploughed, the District Zemstvo compensating the owners at a rate of 7s. 6d. per acre.

Examination of the plants at this season resulted in the discovery, ...he central shoot of the grain, of colonies of lice consisting of one ...ult and up to a dozen young larvae; the first nymph was noticed ... the 1st May. Some syrphid larvae were also found in each colony ...acking the lice. This led the author to consider that winter-sown ...eat would not be injured by the pest, but that barley and oats ...ht be damaged; the result confirmed this view and only after ... second half of the summer did the number of lice increase and ... sporadic damage occur. Special investigations on *Brachycolus* ...re conducted during this summer by N. A. Grossheim, particularly ... respect of their parasites, oviposition of winter eggs, etc., and a ...port on these investigations will be issued. The author points out ...at *Brachycolus noxius* lays its winter eggs on the germinating shoots ... fallen grain and recommends the careful removal of all such grain. He mentions that the District Zemstvo of Eupatoria has decided to appoint a district entomologist, principally to study and deal with this pest. Crops of winter-sown wheat in the same district were also damaged by some small velvet black mites with yellow legs, the identity of which has not yet been established; these mites suck the ...er leaves of the seedlings causing them to wither; they are to be found in groups on the axils of the leaves and are very easily disturbed.

The next pest dealt with is *Lymantria dispar*. The author refers to his observations regarding this pest in his last year's report [see this *Review*, Ser. A, i, p. 361–364] and to the remedies there suggested.

The hatching of the caterpillars this year commenced on the southern slopes of the mountains in the middle of March, while on the northern slopes it took place after the end of the month and continued during nearly the whole of April. The number of the caterpillars was enormous and parasites (*Hadronotus howardii*, Mokr.) were then very seldom found; only in case of egg-masses smeared with naphtha or kerosene did the eggs fail to hatch. The young caterpillars were transported by the wind and got into orchards, where they did considerable damage, especially to apple trees; but after the middle of May the numbers began to decrease, owing to parasites, such as *Apanteles fulvipes*, Hal., and *A. solitarius*, Rtz., and in June the orchards and woods were practically free. Apart from the effect of the parasites and of a fungus disease similar to flacherie, it was observed that many of the insects were dwarfed, while there was a considerable prevalence of males over females and a decrease in the number of eggs laid. The size of the dwarfed moths was only half the normal; the percentage of males was in some cases 88 per cent., and while the normal females have up to 1,200 eggs in their ovaries, the dwarfed ones had only 60. The females hatched out were so weak that they perished without unfolding their wings and before they laid any eggs. Caterpillars collected in June in the forests of the Crimea were also infested by Tachinids and of 2,000 adult larvae collected in one wood, only 32 per cent. produced imagines, while the remainder were killed by parasites. The author thinks that the year 1914 will not witness the appearance of the pests in any noticeable degree except in those spots to which the caterpillars have been carried by the wind and have found specially favourable conditions. I. M. Shtchegolev undertook the statistical part of the investigations, while the author, in company with Miss A. P. Bragina, studied the biology of parasites of the pests and the effect of various insecticides. These studies will be continued this year. He mentions some facts observed which are in conformity with the conclusions of American investigators: pure pear plantations were little damaged, while when mixed with apple trees the former suffered more, and the latter less. Pure beech woods are practically left untouched by the pests, but when scattered amongst oak trees they diminish the injuries to oak, while suffering themselves. The same is also the case with regard to pines, which are totally devoured when situated amongst deciduous trees. Conifers are only touched by the first generation of caterpillars, as observed by Shtcherbakov.

Observations conducted at the Experimental Station of Salgir have shown that there are various species of *Psylla* in the Crimea, the following having been identified by Dr. Karol Sulc., of Moravia: *Psylla pyrisuga*, Först., *P. melanoneura*, Först., *P. albipes*, Flor, *P. pyrarboris*, Sulc., *P. horvathi*, Sulc. The first two species have occurred in large numbers on pear trees, *P. pyrisuga* having one generation, and *P. melanoneura* two. Up till now it has not been definitely established which species live on apple trees and which on pear, and this has led to mistakes and to conflicting statements by various authors.

The last pest dealt with by the author is *Cydia* (*Carpocapsa*) *pomonella*, L., which was studied by Miss A. P. Bragina and I. V. Nikitin. Owing to the wet and rather cold summer, only one generation and a

portion of a second were produced during the year. Out of hundreds of eggs of *C. pomonella* only one parasite was obtained, identified by N. V. Kurdjumov as *Trichogramma fasciatum* (Perkins); as no more eggs of *Cydia* were present the parasite was offered eggs of *Euproctis chrysorrhoea* and of various species of *Mamestra*, *Agrotis*, *Leucoma*, *Catocala* and others, also eggs of spiders, all of which it attacked. From one egg, from 2 to 21 specimens of the parasite were obtained and during 7 months 11 parthenogenetic generations were bred.

The Stations have also conducted observations on *Tmetocera ocellana* and on a Tenthredinid sawfly. The latter pest has done considerable damage to strawberries in the district of Berdiansk; it multiplies parthenogenetically, although both males and females have been observed. Spraying with Paris green in May is recommended as a remedy.

FUSCHINI (C.). **Di un fattore non sufficientemente studiato nella utilizzazione dei microorganismi parassiti d'insetti nocivi.** [An insufficiently studied factor in the employment of micro-organisms parasitic on injurious insects.] *Riv. Vitic. Enol. Agrar., Conegliano*, (5) xx, no. 4, 15th Feb. 1914, pp. 74-76.

The use of parasitic micro-organisms, to assist the agriculturist against his insect enemies, only dates back some 20 years. As in the case of predatory and endophagous insects, quite a new field has been opened up. It is presumed that microparasites exist, capable of reducing the numbers of most injurious insects to a negligible quantity under given conditions. The author holds this last qualification to be the important factor to be studied, if it be desired to reproduce the epidemic artificially. The receptivity of the intended victim is quite as important for infection as the presence of the parasite. The non-success recorded by Lounsbury in infecting locusts with *Coccobacillus acridiorum* is probably due not only to a loss of virulence before use, as suggested by him, but also to defective receptivity on the part of the locusts. The conditions which influence the virulence of the microparasites and the receptivity of their hosts must be studied with equal care.

ISSLEIB (—). **Die Beseitigung der Insekten, welche den Wein- und Obstbau schädigen, durch Verklebung mit Hilfe von Mooschleim.** [The removal of insects injurious to orchards and vineyards by sticking them with seaweed mucilage.]—*Zeitschr. Pflanzenkrankheiten, Stuttgart*, xxiv, no. 2, 28th Feb. 1914, pp. 78-79.

The author believes the employment of seaweed mucilage to be a new and promising method of insect pest control. The mucilage is prepared by boiling 4 lb. of Irish Moss or Iceland Moss (*Fucus caragahen*) in 20 gals. water for one hour, whatever is lost by evaporation being made up. After straining, a thick, slimy liquid results. On drying, this leaves a thin skin which gradually comes away in flakes. If the mucilage is sprayed on infested plants, the pieces which come away will be found to include the eggs and larvae of the pests. The spray must be applied only on dry days as rain will wash away the

mucilage and prevent the skin from forming. Still more effective results are attainable by adding 2 lb. of ethereal oil of mustard dissolved in 10 lb. of methylated spirit, to every 2,000–4,000 lb. of mucilage. This addition must only be made after the mucilage has thoroughly cooled; other insecticides may also be combined with the mucilage. Starch-paste appears to behave in the same manner as seaweed mucilage, but its sticking and killing powers seem less. A sprayer giving a fine jet is required and thoroughness in application is necessary. In spraying for *Clysia ambiguella* in vineyards, not only the stocks but also the stakes and the surrounding ground must be wetted in order to include the eggs on the withered leaves and elsewhere. The development of the moth will regulate the spraying dates, which may be about the middle of April, then before and after flowering, and again after gathering the grapes. This method appears particularly suited for vine moth control. Mustard oil must be used with care as many varieties of the vine are injured by it. A few trials should be made and it is necessary that the face and hands of the operator be protected. The cheapness of the material favours its widespread employment. If prepared at home, 100 lb. of mucilage with $\frac{3}{4}$ oz. of mustard oil will cost about 2s. The mucilage alone is sufficient for control if used in time and with regularity.

Poisoned branmash for cutworms.—*Ninth Ann. Rept. Ontario Vegetable Growers' Assoc.* [1913], *Toronto*, 1914, p. 79.

Onions are subject to serious attacks by certain cutworms which sometimes appear in great numbers in spring and early summer, and frequently do severe injury before their ravages are noticed. They cut off young plants at the surface of the ground and being voracious feeders may destroy many plants in a single night. The usual method of control is by the use of poisoned baits. To a bushel of bran, $1\frac{1}{2}$ lb. of arsenic, or Paris green, is added and mixed thoroughly into a mash with 8 gals. of water, in which has been stirred $\frac{1}{2}$ gal. of sorghum or other cheap molasses. After the mash has stood for several hours it should be scattered in lumps of about the size of a marble at the bases of plants in fields where injury is beginning to appear. It should be applied late in the day, the cutworms being most active at night.

La désinfection des Plants de Vigne. [The disinfection of vines for planting.]—*Rev. Agric. Vitic. Afr. Nord. Algiers*, xii, no. 16?, 21st March 1914, p. 269.

The Service Phylloxérique of the Swiss Department of Agriculture has just recommended the following method of disinfecting vine plants intended for planting. The plants are dipped for 12 hours in a solution prepared by dissolving 2 lb. of soap in 30 gals. water and adding 6 lb. of potassium sulphocarbonate with constant stirring. The roots of the plants must be well covered by the liquid, which must not, however, touch any of the shoots. A thorough washing of the plants completes the treatment, which appears to give perfect results.

ZNAMENSKY (A. V.). **Почковый долгоносикъ.** [*Sciaphobus squalidus*, Gyl.]—**«Труды Полтавской Сельско-Хозяйственной Опытной Станціи.»** [*Studies from the Poltava Agricultural Experimental Station*], *Poltava*, no. 20, 1914, 32 pp. 5 figs., 2 plates.

In a short preface, N. V. Kurdjumov points out that this paper represents the results of three years' work conducted at the Station under his supervision, first by I. V. Nikitin and then by the author. The former's investigations have supplied valuable data as to the parasites of *S. squalidus*, while the latter has succeeded in discovering various important points in the bionomics of the larva.

I. K. Paczoski, in 1897–98, first recorded the damage caused by this weevil in Russia; in 1903, Mokrzecki recorded the insect amongst the pests of the vine, and since 1910 it has been mentioned in the reports of various other entomological stations (Kiev, Smiela, Stavropol and Kishinev); but at the same time, no mention of the insect occurred in many reports from districts (Kursk, Ekaterinoslav, Poltava, Charkov) where it exists in vast numbers and does enormous damage. In European Russia the insect is found over the whole of the South, including the Crimea and the North of Caucasus; it has been found in the governments of Kursk, Kiev, Charkov, Poltava, Cherson and Bessarabia, but probably it exists also in many others. In many districts infested by *S. squalidus*, there occur isolated localities which are free from it, while all surrounding orchards are suffering from swarms of the insects. *S. squalidus* appears generally in the second half of April, but in 1913 it occurred in the first half of that month. While there are still few green plants, the weevils feed mostly on buds, attacking pears, apples, plums, cherries, apricots, and service trees, and raspberry, gooseberry and currant bushes, besides many forest trees. In the government of Poltava it was never found on *Fraxinus excelsior*, *Gleditschia triacanthus*, or white and yellow acacia trees. The majority remain on fruit trees and bushes, damaging the buds, including the flower buds, which sometimes wither and fall off. The percentage of injured buds ranges from 36 to 50 per cent. It is very easy to distinguish the damage done by *S. squalidus* from that done by *Anthonomus pomorum*; it eats out larger holes of irregular form, not round, as is the case with the latter species. The ovaries of the female are quite undeveloped when the beetles emerge, and the maturing of the eggs takes from 3 to 4½ weeks; the males are quite mature on emergence. Oviposition starts every year on approximately the same day, the 10th May, in 1911 and 1913, while in 1912 it was two days earlier. The eggs are deposited underneath the turned-over edge of a leaf, or occasionally between two leaves stuck together; the process of oviposition is described. In captivity the females oviposited freely on leaves of *Pirus aucuparia*, Garth, and on raspberries, but only a few on leaves of *Urtica*; in the open in the garden of the Station, the same preference for *Pirus aucuparia* was noticed; the eggs were frequently found also on apple, pear and plum trees, as well as on oak, *Euonymus*, *Ulmus pedunculata* and very often on *Corylus avellana*. Only once were eggs found on clover. Most of the eggs are deposited during one week, after which the beetles gradually disappear, so that only single specimens can be found at the middle of June. The same mode of oviposition is common also to *Eudipnus micans*, F., the eggs

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laid by the latter being however more numerous and turning brownish after 3–4 days, while the eggs of *S. squalidus* remain white.

The eggs hatch in about 12 or 13 days, and the larvae immediately drop to the earth. Paczoski previously assumed that the larvae live in the earth and the observations in 1912 by Nikitin supported this, the author's investigations have also proved that the larvae feed on the roots of trees and that they pass two years there before pupating. Large larvae were discovered along the roots of a service tree and microscopical examination of their intestines showed the presence of tissues of bark (liber), the roots bearing clear evidence of injury; the same results were also obtained experimentally. The larvae which emerge in spring do not finish their development the same year, but pupate only in August of the following year, producing beetles in September which winter again and issue from the earth only in the following spring. The author has not been able to ascertain the number of moults and only once did he find a freshly moulted larva with the old skin still near it; usually the larvae devour the old skin. The pupa lies at a depth of 18–25 inches, which is also the average depth at which the larva lives. It is assumed that *S. squalidus* belongs to the type of insects which periodically multiply to enormous numbers, doing great damage in these years and afterwards gradually disappearing to quite negligible quantities; the years 1897–1898 were years of its minimum, the numbers increased during the following years and they have decreased again during the past three years. This is attributed to the activity of parasites.

The imago, larva and pupa of *S. squalidus*, owing to their subterranean habit, have few dangerous enemies; thus only the eggs are exposed to attacks of various parasites. Chief amongst these must be placed *Anaphes* sp., of the family MYMARIDAE, which is to be described by Kurdjumov; the infection of the eggs by this parasite is given as 52·4 per cent. for last year. They were mostly infected on the day on which they were laid, and the development of the parasite occupied 10–11 days in the insectarium. The process of oviposition of the parasite is fully described, the ovipositor being driven through the leaf with which the eggs of the hosts are covered. Evidently the sticky material ejected by the female beetle to hold the leaf in place provokes the desire to lay eggs in the parasites; for they drove their ovipositors through a leaf from which all the eggs were removed, but paid no attention to eggs offered without a leaf. Only those eggs which were infested early in their development produce parasites; when the embryo of the host has already developed there is evidently not sufficient nourishment left for the parasite, which perishes with the host.

Two species of *Eulophus* act as ectoparasites of eggs of *S. squalidus*. One of these species emerges from the pupa during the same summer, while the second one winters in the pupal stage on the same spot where the eggs of the host were situated. These species are not numerous and destroyed only about 9·2 per cent. of eggs in 1913. Each larva of the parasite requires 5–6 eggs of the host for its development; the larval stage lasts 10–11 days; the pupal stage of one of them 12–14 days. The eggs of *S. squalidus* are also destroyed by various predaceous insects such as *Aelothrips fasciata*, Hal. and *Haplothrips aculeata kurdjumovi*, Karny, subsp. nov. The author describes the larva of the latter

found by Kurdjumov on colonies of *Aphis crataegi*, Kalt., which they possibly also destroy. The egg stage of this predator lasts 5-6 days, its larval stage 22–25 days, propupa 1–2 days, and pupa 4-5 days, on the average. This Thrips pierces through all the eggs of the heap, thus arresting their further development, and then feeds on them, otherwise it would not be able to accomplish its development, as the eggs of the host hatch in 12–13 days. All these parasites together destroy some 64·4 per cent. of eggs of *S. squalidus*; a table showing the percentage infested by each of them during the investigations of 1913 is given; all of them attack also the eggs of *Eudipnus micans*.

The author then deals with remedies and first describes those applied by some fruit-growers in the government of Taurida. These consist of trenches, usually with straight walls, dug round the trees, or of conical heaps of earth round the trunks, covered with fine sand and surrounded by a trench. None of these obstacles seem very effective in preventing the beetles shaken off the trees from getting back to them. Other appliances are more fully described in the report of the Entomological Station of Kiev for 1912 [see this *Review*, Ser. A, i, pp. 397.] Shaking down the weevils on to sheets was also tried at the station of Poltava during the investigations in 1911 and the results obtained, as shown by two tables, although not conclusive, are considered useful. Picking out specimens of ladybirds which may get on the cloth, before destroying the insects shaken down, is suggested. The remedy most recommended is the use of belts of American tangle-foot. The author gives several tables relating to the experiments in 1912 and 1913, which all show the excellent results obtained by this method. An adhesive made from a recipe suggested by Mokrzecki is also very effective :—1 lb. of castor oil boiled with ½ lb. of resin; if correctly prepared this is as good as tangle-foot. The author agrees that adhesive belts serve rather to drive away the insects, as it is very seldom that beetles are caught by them. Should there be any fruit bushes or vines in the orchard, care must be taken to protect them from the beetles by means of trenches, and the insects must be collected from the trenches as well as from the bushes.

URICH (F. W.). **Description of a New Froghopper from British Guiana.** *Bull. Entom. Research, London*, v, pt. 1, April 1914, p. 43, 2 figs.

A new species of froghopper taken on grass and occasionally on sugar cane in British Guiana is described under the name *Tomaspis pubilatera*.

SAVAGE (R. E.). **The Respiratory System of** *Monophlebus stebbingi*, var. *octocaudata*.—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 45-47, 5 pl.

A detailed description is given of the respiratory system of *Monophlebus stebbingi*, Green, var. *octocaudata*, Green, which differs from the majority of Coccids in having in addition to the meso- and metathoracic pairs, seven pairs of dorsal abdominal spiracles. This species is found on mango, jack fruit and species of *Ficus* in India, but as its life-history is comparatively long, it is rarely a pest; climatic conditions govern the production of large numbers of the individuals, so that outbreaks are irregular.

BALLARD (E.). **Two Pests of Mahogany in Nyasaland.**—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 61-62.

The caterpillars of two moths, *Heteronygmia leucogyna* and *Mussidia albipartalis*, attack mahogany trees in Nyasaland, causing a large amount of damage every year; the former eats the leaves to the extent of defoliating whole plantations, while the latter bores under the bark, causing much deformity of young trees and the formation of corky excrescences, accompanied by the exudation of resin. The life-history of *Heteronygmia leucogyna* is as follows: The eggs are laid in batches of 150-200, low down on the trunk of the tree; the young larvae emerge at the end of nine days, and are pale yellow in colour, with bunches of fine hairs, and measure 3 mm. in length; the fully grown larvae may be pale or dark in colour, with dark heads, and are flattened; their length is 3 cm. The pupa is formed in a very slight cocoon consisting of a few threads, generally on the under side of a leaf or on an excrescence on the bark; the pupal period lasts for ten days. Both larvae and eggs of *H. leucogyna* are heavily parasitised; two species of CHALCIDIDAE and one Ichneumon, *Ecthromorpha variegata*, Brullé, have been bred from the larvae; in May and June nearly 90 per cent. of eggs collected were parasitised, but those found in September and October were unaffected.

The life-history of the bark-borer, *Mussidia albipartalis*, has not been fully worked out; the eggs, apparently laid on the trunk, give rise to larvae which at once bore into the bark; pupation occurs in a cocoon of tough white silk under the rough excrescences produced by the borings of the larva. The insect is parasitised by an Ichneumon and a Chalcid, but not to a sufficient degree to be an important check.

BITZKY (I. G.). **Отчетъ о дѣятельности Прибалтійской станціи по борьбѣ съ вредителями культурныхъ растеній при Рижскомъ Центральномъ Сельско-Хозяйственномъ Обществѣ за 1913 годъ.** [Report on the work done at the Baltic Station against pests of cultivated plants by the Central Agricultural Society of Riga for 1913.]—*Wenden*, 1914, 28 pp.

This is the first yearly report of the Baltic Entomological Station in Wenden and it gives a short history of the organisation and establishment of the Station.

The following were the chief insect pests of field crops. Wireworms of the genus *Agriotes* occur over the whole country, damaging mostly summer-sown cereals and roots. *Apion apricans*, Hbst., is so abundant that it is nearly impossible to find heads of clover not infested by the larvae. Some 500 insects were reared from the cocoons and also two specimens of the Braconid parasite, *Eubazus macrocephalus*, Nees. *Apion violaceus*, Kirby, was also found on clover, but less frequently. Species of *Sitones* injured seedling peas and vetches. Species of *Phyllotreta*, in 1912, destroyed all the turnips, also injuring cabbage, linseed and beets. *Cassida nebulosa*, L., is not common, but is very injurious in some localities to beet-roots; in 1912 a whole field of beet was almost completely devoured by this pest, 5-10 beetles occupying every leaf.

There are no exact data showing that the larvae of *Euxoa segetum*, Schiff., have injured winter-sown cereals during the last two years, but it has been ascertained that these insects occur in the fields of potatoes, beet-roots and carrots. As many as twenty larvae were sometimes found underneath one root of beet; carrots were in some localities injured by them to such a degree that the injury was ascribed to hares; they were found also underneath onions. Species of *Cydia* (*Grapholita*) are spreading over the country to such a degree that the cultivation of peas has become impossible, up to 75 per cent. of the seed being injured by these caterpillars.

Chlorops taeniopus, Mg., was found in 1913 on barley in the fields of the Freidenstein School, 5 per cent. of the plants being injured by this fly. *Oscinis frit*, L., is frequently found.

With regard to orchards and market-gardens, the following pests are mentioned:—*Anthonomus pomorum*, L., together with *Cydia pomonella*, L., is very widespread and does great damage. *Rhynchites betuli*, F., is scarce. *Pieris brassicae*, L., and *P. rapae*, L., are abundant. *Aporia crataegi*, L., and *Vanessa polychloros*, L., are seldom found; *Hyponomeuta malinellus*, Z., occurs in large numbers in some localities and strips the apple trees. *Barathra* (*Mamestra*) *brassicae*, L., proves more injurious to cabbage than *Pieris brassicae*. *Nematus ventricosus*, Kl., is very injurious in some localities to gooseberries and currants. *Chortophila brassicae*, Bouch., is common.

The following insect pests of forests are reported:—*Rhyacionia* (*Evetria*) *resinella*, L., frequently on young pine trees; *Eucosma* (*Grapholita*) *tedella*, Clerk, on firs, especially young plants; *Lymantria monacha*, L., in large numbers in the forests of Kurland.

Dobrovliansky (V. V.). **Наблюденія надъ вредителями полеводства и садоводства, произведенныя Энтом. отдѣл. Кіевской станціи по борьбѣ съ вредителями растеній въ 1913 году.** [Observations on insect-pests of fields-crops and orchards, conducted by the Entomological Branch of the Kiev Station against pests of plants in 1913.]—**«Хозяйство»** [*Husbandry*], *Kiev*, no. 10, 27th March 1914, pp. 332-338.

This is a report of work on insect pests done during 1913 at the Station of Kiev by I. S. Ljubomudrov, who investigated the habits of various Microlepidoptera of the subfamilies Olethreutinae and Tortricinae; by I. F. Bay and D. I. Lessovoy, who dealt with the pests of grain crops; and by B. I. Belsky, who studied *Byturus tomentosus*, Bjerk.

Recurvaria leucatella, L., was found in spring shoots of apple trees, in a short longitudinal mine underneath the bud, causing all the leaves on the shoots to wither. Some of these shoots were cut off on the 19th May and put into water in the laboratory; the caterpillars grew slowly, remaining all the time inside the stem, and at the end of June pupated in their mines; the moths emerged on the 12th and 13th July. On the 9th July some small parasitic Hymenoptera issued from one shoot. The author remarks that this is the first time that caterpillars of *Recurvaria leucatella* have been found inside the stems, as, according to the usual statements, they live inside curled leaves; only the

caterpillars of *Laverna hellerella*, Dup,* and of *Recurvaria nanella*, Hb., have been previously reported to live inside shoots of apple and pear trees.

Olethreutinae and Tortricinae. In the spring of 1913 the leaves of apple trees in most of the orchards in the government of Kiev were damaged by various moths of these subfamilies, on some trees all the leaves being curled. The following species were studied:—*Tmetocera ocellana*, F., *Olethreutis variegana*, Hb., *Pandemis ribeana*, Hb., var. *cerasana*, Hb., and *P. heparana*, Schiff. The caterpillars of *T. ocellana* pupated on the 25th-28th May. Before pupating the caterpillars emerged from the curled leaves, in which they lived, and wove a white cocoon beneath the turned end of a fresh leaf; some pupated even on the walls of the box, or underneath the gauze covering it. Cocoons of these insects were found in the open on the 19th May. In the laboratory the moths emerged on the 11th and 12th June. The caterpillars of *Olethreutis variegana* were found on the 19th May, pupating on the 24th and 25th of that month in the same leaves which they had inhabited; the moths issued on 30th and 31st May. The caterpillars of *Pandemis ribeana* var. *cerasana* and of *P. heparana* pupated between the 23rd and 28th May, between two fresh leaves drawn together; the moths emerged on the 1st and 5th June. In the open the cocoons of these insects were found on the 19th May; on the same day a caterpillar was found with an egg of a Tachinid situated on the first segment of its thorax, on the upper side; this caterpillar pupated two days later and the fly issued in 12 days.

An attempt was made to trap *Euxoa (Agrotis) segetum* in troughs of molasses, which were placed on fallow land and in beet fields at the rate of four to the acre, but of the insects caught only 2 per cent. belonged to this species. Some digging conducted in August on one estate where the caterpillars of *E. segetum* were injurious during the spring, resulted in the finding only of two pupae, both of which were parasitised by *Ambliteles vadatorius*, Ill. Only a few moths of the second generation appeared owing to the large number of parasitised larvae. The first eggs of the second generation were found on the 3rd September.

Byturus tomentosus, F., is a serious pest of raspberries; this beetle hibernates in Western Europe in the pupal stage, but in the governments of Moscow and Kiev it winters as an imago.

Psylliodes picina, Marsh., did great damage in spring to summer and winter-sown cereals on one estate; and were also found in August on trap crops of barley. At night and in cloudy weather the beetles remained in the earth, but in fine weather, in the day time, they fed on the leaves of the grain. Between the 31st August and 6th September copulating pairs were noticed. In the first half of October the beetles buried themselves in the earth to a depth of about an inch. This is the first time that this insect has been recorded as a pest of grain.

Mayetiola (Cecidomyia) destructor, Say, was found on the 28th June in a wheat field on one estate in the pupal stage, 10 per cent. of the plants being attacked. On the 1st September small numbers of the larvae were discovered there in seedlings of volunteer wheat.

*[Mr. J. H. Durrant suggests that the species intended is probably *Laverna atra*, Hw., the larvae of which live in apple shoots in spring; the larvae of *L. hellerella*, on the contrary, feed in hawthorn berries in autumn.—Ed.]

Oscinella (Oscinis) frit, L., was found in very large numbers on one estate; on the 3rd July a trap crop of barley was sown, and in August it was found that 90–100 per cent. of the plants were infested. Preventive measures consisted in reploughing the trap fields and ploughing in the germinating fallen grain; and these proved very effective, an infestation of only 6 per cent. being found in the winter-sown crops. About 14–15 per cent. of the pupae were infected with parasites. On another estate 30 per cent. of the young volunteer wheat was attacked and 15 per cent. of the winter crop.

CHILDS (L.). **The Anatomy of the Diaspinine Scale-Insect, *Epidiaspis piricola*, Del Guer.** *Ann. Entom. Soc. America, Columbus*, vii, no. 1, Mar. 1914, pp. 47-57, 3 pl.

An account of the anatomy of the Italian pear scale.

GILLETTE (C. P.). **Some *Pemphiginae* attacking Species of *Populus* in Colorado.**—*Ann. Entom. Soc. America, Columbus*, vii, no. 1, Mar. 1914, pp. 61-69, 1 pl.

The following Aphids of this subfamily which attack poplars in Colorado are described: *Thecabius populiconduplifolius*, *Asiphum sacculi*, sp. n., and *Mordwilkoja vagabunda*.

HOWARD (L. O.). **Report on Parasites.**—*Ann. Entom. Soc. America, Columbus*, vii, no. 1, Mar. 1914, pp. 86-89.

The report gives an account of the results of disseminating the parasites of the gipsy moth and the brown-tail moth in the infested areas during the past year. Owing to the fact that one of the imported egg-parasites of the gipsy moth, *Anastatus bifasciatus*, breeds very slowly, extensive collections were made during last winter of parasitised gipsy moth egg-clusters from colonies planted in previous years. From this material it was possible to liberate 1,500,000 parasites; these were placed in 1,500 colonies in sections where the insect had not become established. Colonies of *Anastatus* planted a year ago proved to be successful, although the spread was slow. Another egg-parasite of the gipsy moth, *Schedius kuvanae*, has become perfectly established in several places where it had been planted; its numbers had increased and in some cases it had spread nearly a mile and a half beyond the limits of last year's area. The Tachinid *Compsilura concinnata* was abundant in the summer of 1912. *Limnerium disparidis* and *Apanteles* sp., received from Europe, survived the winter and are established; in the case of the latter species, 7 per cent. of parasitism of gipsy moth larvae was found; *Limnerium* has so far shown no marked ability to increase. Another species of *Apanteles*, namely *A. lacteicolor*, an important parasite of the brown-tail moth, has been recovered in large numbers and has been found to attack gipsy moth caterpillars in widely separated regions. The *Calosoma* beetle (*C. sycophanta*) has been observed in large numbers where bad colonies of the gipsy moth were present; the good done by the beetle, which feeds upon the pupae as well as upon the larvae, is considerable. *Monodontomerus aereus* was found to have spread over practically the entire territory known to be infested by the brown-tail moth; *Ptero-*

malus egregius occurs over the same area, its numbers being on the increase.

COLLINS (C. F.). **The Peach and its Culture.**—*Mthly. Bull. State Comm. Hortic., Sacramento, Cal.*, iii, no. 3, March 1914, pp. 144-149.

The author states that the peach worm or twig borer (*Anarsia lineatella*), which is one of the most serious insect pests of the peach in California, is best controlled by spring spraying with lime-sulphur. Mention is also made of the almond mite which often attacks trees in the interior valleys during early summer. These are effectively controlled by dusting the trees with flowers of sulphur, which should be used as soon as the mites appear, with a hand-operated sulphur machine from a wagon, in order to reach the tops of the trees where the mites are most numerous. One man with a steady team should easily cover 400 fully-grown trees in ten hours.

COOLE (A. J.). **Idaho Quarantines against California.**—*Mthly. Bull. Sta. Commis. Hortic., Sacramento, Cal.*, iii, no. 3, March 1914, p. 156.

The importation into the State of Idaho of potatoes from California has been prohibited, on account of the prevalence in the latter State of the potato tuber moth (*Phthorimaea operculella*). Idaho has also placed an embargo on all shipments of nursery stock from 21 Californian counties, because of the ravages of the pear thrips (*Euthrips pyri*) in their orchards. While recognising the necessity of keeping orchards free from pests, the author's investigations lead him to think that this embargo is unnecessary, as it is doubtful if the insects are in the soil in the nurseries. Should they be in the ground where young trees are grown, the thorough washing of the roots would undoubtedly remove all danger.

BORODIN (D.). **О мѣрахъ борьбы съ проволочнымъ червемъ.** [Measures against Elaterid larvae.]—**«Хуторянинъ»** [*Chutorianin*], *Poltava*, no. 12, 2nd April 1914, p. 382.

The author states that the best remedies for Elaterid larvae are various baits, poisoned or otherwise, consisting of slices of potatoes, carrots, beets, oil cakes, cabbage stalks, etc., which are buried in the earth at a depth of 3–4 inches in various parts of the fields. These baits are poisoned by adding to them either Paris green or arsenic, in which case they need no further attention; in case of unpoisoned baits they must be inspected practically every week and the larvae found on them destroyed with boiling water. He also recommends maize baits, prepared as follows: About $\frac{1}{4}$ lb. of white arsenic and $2\frac{1}{2}$ lb. of maize well boiled in about $2\frac{1}{2}$ gallons of water, care being taken not to inhale the vapour.

The baits can be best used in autumn and spring, before sowing, or even afterwards, so long as the seedlings are not too high.

The Narcissus Fly (*Eumerus lunulatus*).—*Gardeners' Chron., London*, 28th March, 4th and 18th April 1914, pp. 223, 240 and 272.

Referring to the case of a narcissus bulb containing larvae of the small narcissus fly (*Eumerus lunulatus*) exhibited at a meeting of the Roy.

Hort. Soc. Scientific Committee, Mr. A. J. Bliss writes stating that, although more knowledge is wanted, evidence is strongly in favour of *E. lunulatus* being merely a scavenger, feeding on the excreta of *Merodon* grubs which inhabit the bulbs, or on decayed bulbs which have been attacked by fungoid diseases; the facts that the larva can live on a variety of plants (rhizomes of iris, etc.), has no special food-plant, and has only done harm when *Merodon* or fungi have previously attacked the bulb, support the author's arguments. Mr. C. E. Shea, however, believes that the larvae are not hatched on the bulbs and he does not think that the larva is only a scavenger, since his own experience does not clearly demonstrate the relationship with *Merodon* or fungoid diseases.

GORSKY (P.). **Какъ уничтожить муравьевъ.** [How to destroy ants.] **«Прогрессивное Садоводство и Огородничество»** [*Progressive Fruit-growing and Market-gardening*,] *St. Petersburg*, no. 13, 12th April 1914, pp. 403-404.

The author suggests the following remedies against ants:—Spraying over ant-hills and spots attacked by ants with powdered caustic lime gives good results; if scattered round the trunks of trees it will prevent the ants from passing on to them, but the lime must be renewed from time to time. A lump of caustic lime placed inside an ant-hill will soon exterminate the insects if plenty of water is poured over the spot. Ant-hills may be treated with one-half to one pint of tar or kerosene in 3 gallons of boiling water. A solution of $\frac{3}{4}$ lb. of hyposulphite of soda in 5 pints of warm water is also useful and is harmless to the roots of trees, though on beds of plants a weaker solution must be applied and repeated in 1-2 weeks. In order to prevent ants getting on to trees, belts of cotton wool moistened with 20 per cent. carbolic acid may be used.

VUILLET (A.). **Utilisation de Certains Insectes Phytophages dans la Lutte contre les Ennemis des Plantes Cultivées.** [Utilisation of certain phytophagous insects in combating pests of cultivated plants.]—*Révue Scientifique, Paris*, 25th April 1914, pp. 526-530.

A general account is given of the usefulness of certain insects, themselves phytophagous, in combating pests of cultivated plants. They may be useful in acting as hosts for entomophagous species which prey upon the pest, such as *Siphonophora leptadeniae*, which harbours the parasites of *Aphis sorghi*, and *Barathra* (*Mamestra*) *brassicae*, which acts as a host for the parasite *Trichogramma semblidis* of the vine pest *Polychrosis botrana*. Another example given is *Alabama argillacea*, a casual pest on cotton, but which is nevertheless useful, provided it appears late, in suppressing indirectly the far more dreaded annual pest *Anthonomus grandis* by robbing it of its food supply.

VUILLET (A.). **Note synonymique sur le Thrips des Pois.** [Synonymy of the Pea Thrips.]—*Bull. Soc. Entom. France, Paris*, 1914, no. 5, pp. 161-162.

The pea thrips has been referred to by different writers as *Thrips*

pisivora, *T. physapus*, *Physapus robusta* and *Frankliniella robusta*. The author points out that all these names refer to a single species, and also that neither *Thrips* nor *Physapus* can stand as names for genera, so that the correct name is *F. robusta*.

LEONARDI (G.). **Contribuzione allo studio delle Cocciniglie dell'Eritrea (Africa orientale).** [A contribution to the study of the Coccids of Eritrea (East Africa).]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 27-38, 12 figs.

The author describes four new species of Coccids from Eritrea: *Ceroplastes erithraeus* found on *Acacia*, *Saissetia cuneiformis* and *Lepidosaphes fiorii* on *Rhus aztechesan*, and *Pulvinaria dicrostachys* on *Dichrostachys nutans*.

LEONARDI (G.). **Nuove specie di Diaspiti viventi sull' Olivo.** [New species of Diaspinae living on the olive tree.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 66-71, 5 figs.

Two new Coccids, described by the author as *Aonidia oleae* and *Lepidosaphes olivina*, and a species of *Aspidiotus* were found on olive trees on the Eritrean tableland.

LEONARDI (G.). **Nuove specie di Cocciniglie raccolte in Italia.** [New species of Coccids collected in Italy.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 59-65, 5 figs.

The following three new species of Coccids collected in Italy are described: *Pseudococcus grassii* found on some bananas bought at Rome, *Aspidiotus viticola* on the vine and *Aonidiella inopinata* on the almond.

SZÉPLIGETI (Gy.). **Braconidae gesammelt von Prof. F. Silvestri in Africa.** [Braconids collected in Africa by Prof. F. Silvestri.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 101-104.

The following Braconids are described: *Bracon celer*, sp. n., from Cape Colony; *Bracon lagosianus*, sp. n., *Pseudobracon nigripennis*, Szépligeti, *Pseudobracon silvestrii*, sp. n., *Pseudodoryotes cameruns*, Szép., and *Biphymaphorus pulchripennis*, sp. n., from Lagos; *Disophrys lutea*, Brul., *Cremnops rufitarsis*, sp. n. and *Cremnops variabilis*, Szép., from French Guinea; *Cardiochiles longiceps*, Rom., from Senegal; *Biosteres caudatus*, sp. n., from Nigeria.

RAZZAUTI (A.). **Presenza e danni del *Pantomorus fulleri* in Italia.** [*Pantomorus fulleri*, its occurence and the injury caused by it in Italy.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii, 1913, pp. 113-124, 7 figs.

Systematic notes, a full description of the various stages, the distribution and a bibliography of this Curculionid, known in the United States as Fuller's Rose Beetle, are given in this paper. First observed in the United States in 1879, the injury caused by *P. fulleri* has been of common occurrence since it is markedly omnivorous both in the

larval and adult stages. In the southern States, such as California, it lives in the open and seriously damages citrus plantations, while in colder regions, fruit and ornamental trees in the greenhouse are subject to its attack. The rose and geranium suffer severely and its other hosts include a great variety of garden plants, as well as almond and peach trees. Amongst species of *Citrus* it specially attacks *C. limonum* and to a less degree *C. aurantium* and *C. bergamina*, while *C. vulgaris* and *C. deliciosa* have not been touched. In 1913, trees growing in the open were attacked, though at Leghorn during recent years, citrus trees in pots, but not those in the open, have been infested. Both the small and the larger roots are attacked by the larva and the author has observed fungus spots on the surface of the injured roots. The plants look sickly, lose their leaves and finally wither. The imago feeds on the young buds and the mature leaves, which may be skeletonised in severe cases. *Pantomorus* further damages the young fruit by boring them at the point of attachment, thus causing them to wither. In Italy the beetles first appear towards the end of June, and being mostly nocturnal in habit, remain on the plant during the day. Oviposition takes place from the middle of August right through September. The eggs are laid in masses of 30 to 60. The larva, which hatches out in from 21 days to a month, at once burrows into the soil and attacks the young roots which are nearest the surface. In Italy the larval stage lasts until the end of the following spring, and the pupal stage from 20 to 30 days. *P. fulleri* seems to have been first observed in Italy in 1898, when it was found in Liguria, whence it is said to have been imported to Leghorn in 1908. In view of the extensive culture of Citrus in Sicily, it is to be hoped that its present circumscribed range may be maintained.

In the United States the natural enemies of *P. fulleri* are little known, but artificial methods of control, such as injections of carbon bisulphide, kerosene emulsion or tobacco extract, are stated to give good results. As the damage done in Leghorn is very slight, the author has not tried any of these remedies and has simply advised immersion of the plants in water for one or two days, which method has proved effective. Like most other Curculionids *P. fulleri* drops to the ground when touched, and by spreading a white sheet beneath the plant infested, the weevils are easily shaken off and collected. Subsequent banding of the trunk at a little distance from the ground will prevent a further infestation.

CECCONI (G.). **La** *Grapholitha leplastriana*, **Curtis, dannosa ai cavoli coltivati.** [*Cydia leplastriana*, Curtis, as a pest of cauliflowers.] — *Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, vii. 1913, pp. 125-148, 1 pl.

Up to now the caterpillar of this moth was supposed to live exclusively on wild cabbages (*Brassica oleracea* var. *silvestris*, L.), but the author has discovered it in Italy on cauliflowers cultivated at Fano, in the Province of the Marche. The peasants there have known it as a pest for many years and on account of its ravages they now sow the seed after the 24th June instead of before, as was their former custom. In 1912, for instance, sowing was put off until about the 20th of July. In time, however, the insect has modified its habits

accordingly and late sowing is now no remedy. Two generations occur annually. The larva eats away the terminal bud, though even in years of severe infestation a large number of plants escape.

Control may be effected (1) by destroying the young plants which are infested; (2) by putting such plants in developing boxes in order to bring out and develop any possible parasites in the caterpillars; (3) by covering the beds of plants just above the ground with gauze, so as to prevent the moths from ovipositing on them. In this case some plants should be left as traps and such as become infested should be dealt with as under (1) and (2).

GRANDI (G.). **Descrizione di un nuovo Coccinellide africano,** *Serangium giffardi*, **sp. n.** [Description of a new African Coccinellid, *Serangium giffardi*, sp. n.]—*Boll. Lab. Zool. Agrar. R. Scuola Sup. Agric., Portici*, 1914, pp. 165-178, 8 figs.

A description is given of *Serangium giffardi*, which was collected in Nigeria and in the Cameroons by Professor Filippo Silvestri. Both the adult beetle and its larva are actively predaceous on ALEURODIDAE.

RODZIANKO (V. N.). **О миндальномъ съмяѣдѣ, повреждающемъ сливы и абрикосы въ Астраханской губерніи.**—[On *Eurytoma amygdalis*, Enderlein, which injures plums and apricots in the govt. of Astrachan.] *Kiev*, 1913, 10 pp.

Eurytoma amygdalis was first described by Enderlein in 1907, when it was assumed to be a parasite, although the host was not known; it was obtained by K. Malkov in Bulgaria from mature seeds of almond, and nearly at the same time by J. F. Schreiner in the government of Astrachan, where its larvae damaged plums and apricots. The author refers also to some similar investigations on this insect by A. F. Fortunatov and by S. A. Mokrzecki in Astrachan.

The mature larva of *Eurytoma amygdalis* hibernates inside the stone of a plum or apricot, pupates there in spring and the imago emerges soon afterwards, having gnawed a hole in the walls of the stone and through the fruit. The female lays its egg inside the young fruits and the larva lives inside the stone, feeding on the unripened kernel; one larva lives inside one stone and usually destroys the whole kernel. The attacked fruits fall off either when still green or in a half matured state, though some are able to ripen and cannot be distinguished from healthy fruits. The author believes that this is due to the long period over which the females oviposit; if the egg has been laid early, the larva is able to destroy the kernel, thus causing the fruit to fall prematurely; if the egg has been laid later the fruit may be able to ripen. This assumption requires confirmation.

One generation of the insects occurs during the summer. Schreiner assumes that the females lay the eggs in the parenchyma underneath the epidermis, but the author thinks that it may also be true that the female pierces with its ovipositor through the parenchyma and the walls of the stone, which are then still soft. The author describes the larva and pupa and corrects, by request of Günther Enderlein, an error in the description of the female by the latter; the annulus (of the antenna) is as broad as or slightly broader than long, *not* twice as long as broad, as stated in the description.